

general construction

divisions 0 thru 48

1

Third Floor Renovations

STEVENS HENAGER COLLEGE BUILDING
383 SOUTH VINE STREET, MURRAY, UTAH

OWNER

Intermountain Healthcare
36 S State Street, 16th Floor | Salt Lake City, Utah

DATE

27 March 2020

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INVITATION TO BID

PROJECT: Renovation to the third floor of the Stevens-Henager College Building for Intermountain Healthcare

LOCATION: 383 West Vine Street, Murray, Utah

OWNER: Intermountain Healthcare.

TIME AND PLACE: The Owner will receive bids on Friday, April 10, 2020 at 3:00 pm:

Intermountain Healthcare
Security Desk - 16th Floor
36 South State Street
Salt Lake City, Utah 84111-1486

Attention: Jody Cavazos (jody.cavazos@imail.org)

Bids shall be received by sealed envelope or emailed electronically to the Owner by time and at address noted above. If submitting a sealed bid, deliver to Security on the 16th floor.

The Owner intends to evaluate bids on April 14, 2020.

TYPE OF BID: Bids shall be on a lump sum basis.

TIME OF COMPLETION Bidders shall provide a construction duration in calendar days and a Date of Substantial Completion on their bid forms. Consideration will be given to bidders offering earlier times of completion.

BIDDING DOCUMENTS: Bidding documents will be available on March 27, 2020, thru the office of VCBO Architecture, 524 South 600 East, Salt Lake City, Utah 84102 in accordance with the Instructions to Bidders. PDF's will be given to invited Contractors only. Bidding documents are not to be posted in the plan rooms.

BONDS: Bonds will not be required for this project.

RIGHT TO REJECT BIDS: The Owner reserves the right to reject any or all bids, and to waive any irregularities in any bid or in the bidding

MANDATORY PREBID CONSTRUCTION MEETING Wednesday, April 1, 2020 at 10:00 am at Project site; attendees are limited to project managers for General Contractors only, in order to keep total number within recommended guidelines, no subcontractors will be allowed to attend.

END OF SECTION

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SECTION 00 2213

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

- A. The Supplementary Instructions to Bidders herein describe, contain changes and additions to Section 00 0100 - AIA A701 Instructions to Bidders (included by reference - copies may be obtained from the Architect's office for the cost of reproduction). Where any part of the Instructions to Bidders is modified by these Supplementary instructions, the unaltered provisions shall remain in effect.

3.1.5 COPIES

Add the following:

The title or cover sheet to the drawings and the index to the Project Manual contains a list of all documents which comprise a full set of bid documents for this project. Any Contractor, Subcontractor, vendor or any other person participating in or bidding on this project shall be responsible for the information contained in any and all sheets of drawings and all sections of the specifications. If any person, party or entity elects to submit bids for any portion, or all, of this project, that person, party or entity shall be responsible for any and all information contained in these drawings and specifications, including, but not limited to, any subsequent addendums or clarifications that may be issued.

3.3 SUBSTITUTIONS

Amend 3.3.2 to read:

No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least 7 days prior to the date for receipt of Bids. Such requests...

3.4 ADDENDA

Amend 3.4.3 to read:

No addenda will be issued later than 24 hours prior to the date for receipt of Bids except an addendum may be issued no later than 12 hours prior to the date for receipt of bids for the purpose of cancellation or postponement of receipt of bids. It is the responsibility of the Bidder to disseminate telephone addendum information to sub-bidders.

4.2 BID SECURITY

~~Delete~~ this article in its entirety. Bid bonds will not be required for this project.

4.3 SUBMISSION OF BIDS

Amend 4.3.4 to read:

Bids shall be hand delivered in sealed envelope or emailed to the Owner at the address noted in the Invitation to Bid. Bids submitted orally, or by telephone or facsimile will not be considered.

5.3 ACCEPTANCE OF BID (AWARD)

Amend 5.3.2 to read:

The Owner shall ... to determine the low bidder on the basis of the sum of the Base Bid or on the basis of the sum of the Base Bid and any combined accepted Alternates. Cost of insurance will not be used as the basis of award.

ARTICLE 7 - PERFORMANCE AND PAYMENT BOND

Delete this Article in its entirety. Bonds will not be required for this Project.

END OF SECTION

SECTION 00 4000

BID FORM

TO: **Intermountain Healthcare**
Facility Planning and Development
36 South State Street, 16th Floor
Salt Lake City, Utah 84111-1486

Attention: Jody Cavazos (jody.cavazos@imail.org)

PROJECT: INTERMOUNTAIN HEALTHCARE SHC 3rd FLOOR REMODEL
383 West Vine Street
Murray, Utah

NAME OF BIDDER: _____

DATE: _____

The undersigned, in compliance with the Invitation for Bids, having examined the Drawings and Specifications and related 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 propose to furnish all labor, materials, services, equipment and appliances required in connection with or incidental to the construction of the above named project in strict conformance with the following specification and drawings:

Instructions to Bidders, General Conditions, Supplemental General Conditions, Specification Divisions as shown and all applicable addenda and Drawings as listed on the drawing cover sheets as prepared by VCBO Architecture.

BASE BID – for the SHC 3rd FLOOR REMODEL for Intermountain Healthcare:

For Work of the contract listed above and shown on the drawings and described in the Project Manual, I/We agree to perform for the sum of:

_____ Dollars (\$ _____)
(In the case of discrepancy, written amount shall govern)

CONTRACTOR’S PROPOSED CONSTRUCTION TIME PERIOD:

This bid requires a construction time in **calendar days** from the date of authorization of _____ calendar days. The anticipated date of Substantial Completion is thus _____, 202_.

The above bid includes _____ winter weather delay days.

ADDENDA:

I/We acknowledge receipt of the following addenda for the **SHC 3rd FLOOR REMODEL**: ___/___/___/___

TYPE OF ORGANIZATION:

Corporation, Partnership, Individual, etc.) _____

SEAL (If a Corporation)

Respectfully Submitted,

Name of Bidder

Authorized Signature

SECTION 00 4373

SCHEDULE OF VALUES

NAME OF BIDDER: _____

DATE: _____

DIV	TITLE	AMOUNT	\$/SQ. FT	COMMENT/SUBCONTRACTORS
01	General Conditions	\$ _____	\$ _____	
02	Demolition	\$ _____	\$ _____	
02	Saw cut slab	\$ _____	\$ _____	
03	Concrete	\$ _____	\$ _____	
05	Steel	\$ _____	\$ _____	
06	Woods and Plastics	\$ _____	\$ _____	
07	Thermal and Moisture Protection	\$ _____	\$ _____	
08	Openings	\$ _____	\$ _____	
09	Finishes	\$ _____	\$ _____	
10	Specialties	\$ _____	\$ _____	
11	Equipment	\$ _____	\$ _____	
12	Furnishings	\$ _____	\$ _____	
22	Plumbing	\$ _____	\$ _____	
23	HVAC	\$ _____	\$ _____	
26	Electrical	\$ _____	\$ _____	
	SUBTOTAL	\$ _____	\$ _____	
	OVERHEAD AND PROFIT	\$ _____	\$ _____	
	TOTAL COST	\$ _____	\$ _____	

END OF SECTION

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SECTION 00 5200

OWNER/CONTRACTOR AGREEMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. AIA Document A101 '**Standard Form of Agreement for Construction between the Owner and General Contractor**' where the basis of payment is a STIPULATED SUM, will *presumably* be used on this project. A copy may be obtained from the Architect for the cost of reproduction.
- B. **The Owner reserves the right** to use a contract form of their own creation.

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SECTION 00 5433

ELECTRONIC MEDIA AGREEMENT

PART 1 - GENERAL

1.1 AGREEMENT CONCERNING DRAWING FILES ON ELECTRONIC MEDIA

- A. The electronic files will be distributed from the Architect to the General Contractor only once the following form has been signed. It will be the General Contractor's responsibility to control distribution.
- B. Valentiner Crane Brunjes Onyon Architects, L.L.C. (the Architect) does not assume any responsibility for the accuracy of the information contained in these drawing files. Any and all users are aware that differences may exist between the electronic files delivered and the printed hard-copy construction documents. In the event of a conflict between the signed and sealed hard-copy construction documents prepared by the Architect and the electronic files, the signed or sealed hard-copy construction documents shall govern.
- C. Any and all users who may obtain these drawings **from the General Contractor** under this agreement, including but not limited to; subcontractors, vendors, suppliers etc., agree to indemnify and hold harmless the Architect, its officers, directors, employees and sub-consultants against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising from any changes made by anyone other than the Architect or from any transfer or reuse of the electronic files including data contained in the files without the prior written consent of the Architect.
- D. Building Information Model (BIM) drawing files will be made available to the Contractor and its subcontractors for the purposes of preparing submittals for their portion of the work **only** after the "Agreement Concerning Drawing Files on Electronic Media" has been signed by the General Contractor.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

AGREEMENT CONCERNING DRAWING FILES ON ELECTRONIC MEDIA

Valentiner Crane Brunjes Onyon Architects, L.L.C. (the Architect) does not assume any responsibility for the accuracy of the information contained in these digital models. Any and all users are aware that differences may exist between the electronic files delivered and the printed hard-copy construction documents. In the event of a conflict between the signed and sealed hard-copy construction documents prepared by the Architect and the electronic files, the signed or sealed hard-copy construction documents shall govern.

Any and all users who may obtain these digital models from the General Contractor under this agreement, including but not limited to; subcontractors, vendors, suppliers etc., agree to indemnify and hold harmless the Architect, its officers, directors, employees and sub-consultants against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising from any changes made by anyone other than the Architect or from any transfer or reuse of the electronic files without the prior written consent of the Architect.

Under no circumstances shall delivery of the electronic digital models be deemed a sale by the Architect, and the Architect makes no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall the Architect be liable for any loss of profit or any consequential damages as a result of the use or reuse of the electronic files.

The digital Building Information Models provided will contain information as provided on construction documents. The user shall remove all notes, text, detail cuts and member designations from the electronic file prior to use. If used as submittal documents, submittals will be rejected if non-compliant. The drawing files provided by VCBO may not be reproduced or distributed to individuals outside the company or collective organization signing this agreement.

LIST OF DRAWINGS:

Project Name: **INTERMOUNTAIN HEALTHCARE SHC 3rd FLOOR REMODEL**

VCBO Project # **19800**

List of Revit Models: **Architectural, Structural, Mechanical and Electrical.**

ACCEPTANCE OF TERMS, CONDITIONS & LIMITATIONS:

Name of Company/Contractor

Signature of Company/Contractor Representative

Printed Name of Individual Signing

Position/Title

Date

This agreement must be signed and returned to VCBO prior to release of any electronic document.

SECTION 00 6000

BONDS AND CERTIFICATES

PART 1 - GENERAL

1.1 SUMMARY

- A. The following AIA documents are incorporated by reference; copies may be obtained from the Architect for the cost of reproduction.
1. AIA Document G702 – 'Application and Certificate for Payment'
 2. AIA Document G703 – 'Application and Certificate for Payment - Continuation'
 3. AIA Document G701 – 'Change Order'
 4. AIA Document G704 – 'Certificate of Substantial Completion'
 5. AIA Document G707 – 'Consent of Surety to Final Payment'
 6. AIA Document G707A – 'Consent of Surety to Reduction in or Partial Release of Retainage'

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SECTION 00 6276.13

EXEMPTION CERTIFICATE

PART 1 - GENERAL

1.1 SUMMARY

- A. Construction materials purchased by or on behalf of Intermountain Healthcare *may be* exempt from Utah sales and use taxes. Tax Exempt Form TC-721 must be used by vendors when purchasing construction materials for Intermountain Healthcare projects. A copy of Form TC-721, with the Owner's pertinent tax information, follows this cover page.

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Exemption Certificate

(Sales, Use, Tourism and Motor Vehicle Rental Tax)

TC-721

Rev. 11/17

Name of business or institution claiming exemption (purchaser)		Telephone number	
Street address	City	State	ZIP Code
Authorized signature	Name (please print)	Title	
Name of Seller or Supplier:			Date
Sales Tax License Number:	N10701	<i>Required for all exemptions marked with an asterisk (*)</i>	

The signer of this certificate **MUST** check the box showing the basis for which the exemption is being claimed.

DO NOT SEND THIS CERTIFICATE TO THE TAX COMMISSION

Keep it with your records in case of an audit.

For purchases by government, Native American tribes and public schools, use form TC-721G.

Resale or Re-lease

I certify I am a dealer in tangible personal property or services that are for resale or re-lease. If I use or consume any tangible personal property or services I purchase tax free for resale, or if my sales are of food, beverages, dairy products and similar confections dispensed from vending machines (see Rule R865-19S-74), I will report and pay sales tax directly to the Tax Commission on my next sales and use tax return.

Religious or Charitable Institution

I certify the tangible personal property or services purchased will be used or consumed for essential religious or charitable purposes. **This exemption can only be used on purchases totaling \$1,000 or more, unless the sale is pursuant to a contract between the seller and purchaser.**

Construction Materials Purchased for Religious and Charitable Organizations

I certify the construction materials are purchased on behalf of a religious or charitable organization and that they will be installed or converted into real property owned by the religious or charitable organization.

Name of religious or charitable organization:
Intermountain Healthcare

Name of project: SHC 3RD FLOOR RENOVATION

Machinery and Equipment and Normal Operating Repair or Replacement Parts Used in a Manufacturing Facility, Mining Activity or Web Search Portal or Electronic Payment Service

I certify the machinery and equipment and normal operating repair or replacement parts have an economic life of three years or more and are for use in a Utah manufacturing facility described in SIC Codes 2000-3999; in a qualifying scrap recycling operation; in a co-generation facility placed in service on or after May 1, 2006; in the operation of a Web search portal by a new or expanding business described in NAICS Code 518112 between July 1, 2010 and June 30, 2014; in the operation of an electronic financial payment service described in NAICS Code 522320; or in a business described in NAICS 212, Mining (except Oil and Gas), or NAICS 213113, Support Activities for Coal Mining, NAICS 213114, Support Activities for Metal Mining, or NAICS 213115, Support Activities for Nonmetallic Minerals (except Fuels) Mining. For a definition of exempt mining equipment, see Utah Code §59-12-104(14).

Fuels, Gas, Electricity

I certify all natural gas, electricity, coal, coke, and other fuel purchased will be used for industrial use only and not for residential or commercial purposes.

Refinery Machinery, Equipment and Normal Repair or Replacement Parts

I certify the machinery, equipment, normal operating repair parts, catalysts, chemicals, reagents, solutions or supplies are for the use of a refiner who owns, leases, controls or supervises a refinery (see Utah Code §63M-4-701) located in Utah.

Auto, Industrial Gas, or Drilling Equipment Manufacturer

I certify the machinery, equipment, normal operating or replacement parts are used or consumed in a manufacturing process as described in NAICS 336111 (Automotive Manufacturing), or 325120 (Industrial Gas Manufacturing) to manufacture hydrogen of the 2002 North American Industry Classifications Systems, or by a drilling equipment manufacturer as defined in Utah Code §59-12-102.

Pollution Control Facility

I certify our company has been granted a "Certification of Pollution Control Facilities" as provided for by Utah Code §§19-12-101 - 19-12-305 by either the Air Quality Board or the Water Quality Board. I further certify each item of tangible personal property purchased under this exemption is qualifying.

Steel Mill

I certify the rolls, rollers, refractory brick, electric motors or other replacement parts will be used in the furnaces, mills or ovens of a steel mill as described in Standard Industrial Classification (SIC) 3312.

Municipal Energy

I certify the natural gas or electricity purchased: is for resale; is prohibited from taxation by federal law, the U.S. Constitution, or the Utah Constitution; is for use in compounding or producing taxable energy; is subject to tax under the Motor and Special Fuel Tax Act; is used for a purpose other than as a fuel; is used by an entity exempted by municipal ordinance; or is for use outside a municipality imposing a municipal energy sales and use tax. The normal sales tax exemptions under Utah Code §59-12-104 do not apply to the Municipal Energy Sales and Use Tax.

Short-term Lodging Consumables

I certify the tangible personal property is consumable items purchased by a lodging provider as described in Utah Code §59-12-103(1)(i).

Direct Mail

I certify I will report and pay the sales tax for direct mail purchases on my next Utah *Sales and Use Tax Return*.

Commercial Airlines

I certify the food and beverages purchased are by a commercial airline for in-flight consumption; or, any parts or equipment purchased are for use in aircraft operated by common carriers in interstate or foreign commerce.

Commercials, Films, Audio and Video Tapes

I certify that purchases of commercials, films, prerecorded video tapes, prerecorded audio program tapes or records are for sale or distribution to motion picture exhibitors, or commercial television or radio broadcasters. If I subsequently resell items to any other customer, or use or consume any of these items, I will report any tax liability directly to the Tax Commission.

Alternative Energy

I certify the tangible personal property meets the requirements of Utah Code §59-12-104 and is leased or purchased by or for an alternative energy electricity production facility, a waste energy production facility, or a facility that produces fuel from alternative energy.

Locomotive Fuel

I certify this fuel will be used by a railroad in a locomotive engine.

Research and Development of Alternative Energy Technology

I certify the tangible personal property purchased will be used in research and development of alternative energy technology.

Life Science Research and Development Facility

I certify that: (1) the machinery, equipment and normal operating repair or replacement parts purchased have an economic life of three or more years for use in performing qualified research in Utah; or (2) construction materials purchased are for use in the construction of a new or expanding life science research and development facility in Utah.

Mailing Lists

I certify the printed mailing lists or electronic databases are used to send printed material that is delivered by U.S. mail or other delivery service to a mass audience where the cost of the printed material is not billed directly to the recipients.

Semiconductor Fabricating, Processing or Research and Development Material

I certify the fabricating, processing, or research and development materials purchased are for use in research or development, manufacturing, or fabricating of semiconductors.

Aircraft Maintenance, Repair and Overhaul Provider

I certify these sales are to or by an aircraft maintenance, repair and overhaul provider for the use in the maintenance, repair, overhaul or refurbishment in Utah of a fixed-wing, turbine-powered aircraft that is registered or licensed in a state or country outside Utah.

Ski Resort

I certify the snow-making equipment, ski slope grooming equipment or passenger rope-ways purchased are to be paid directly with funds from the ski resort noted on the front of this form.

Machinery or Equipment Used by Payers of Admissions or User Fees

I certify that: (1) the machinery or equipment has an economic life of three or more years and will be used by payers of admissions or user fees (Utah Code §59-12-103(1)(f)); (2) the buyer is in the amusement, gambling or recreation industry (NAICS Subsector 713); and (3) at least 51 percent of the buyer's sales revenue for the previous calendar quarter came from admissions or user fees.

Telecommunications Equipment, Machinery or Software

I certify these purchases or leases of equipment, machinery, or software, by or on behalf of a telephone service provider, have a useful economic life of one or more years and will be used to enable or facilitate telecommunications; to provide 911 service; to maintain or repair telecommunications equipment; to switch or route telecommunications service; or for sending, receiving, or transporting telecommunications service.

Leasebacks

I certify the tangible personal property leased satisfies the following conditions: (1) the property is part of a sale-leaseback transaction; (2) sales or use tax was paid on the initial purchase of the property; and, (3) the leased property will be capitalized and the lease payments will be accounted for as payments made under a financing arrangement.

Film, Television, Radio

I certify that purchases, leases or rentals of machinery or equipment will be used by a motion picture or video production company for the production of media for commercial distribution.

Prosthetic Devices

I certify the prosthetic device(s) is prescribed by a licensed physician for human use to replace a missing body part, to prevent or correct a physical deformity, or support a weak body part. This is also exempt if purchased by a hospital or medical facility. (Sales of corrective eyeglasses and contact lenses are taxable.)

Out-of-State Construction Materials

I certify this tangible personal property will be shipped out of state and will become part of real property located in a state that does not have a sales tax or allow credit for tax paid to Utah.

Construction Materials Purchased for Airports

I certify the construction materials are purchased by, on behalf of, or for the benefit of Salt Lake International Airport, or a new airport owned or operated by a city in Davis, Utah, Washington or Weber County. I further certify the construction materials will be installed or converted into real property owned by and located at the airport.

Agricultural Producer

I certify the items purchased will be used primarily and directly in a commercial farming operation and qualify for the Utah sales and use tax exemption. **This exemption does not apply to vehicles required to be registered.**

Tourism/Motor Vehicle Rental

I certify the motor vehicle being leased or rented will be temporarily used to replace a motor vehicle that is being repaired pursuant to a repair or an insurance agreement; the lease will exceed 30 days; the motor vehicle being leased or rented is registered for a gross laden weight of 12,001 pounds or more; or, the motor vehicle is being rented or leased as a personal household goods moving van. This exemption applies only to the tourism tax (up to 7 percent) and the short-term motor vehicle rental tax (Transportation Corridor Funding – 2.5 percent) – not to the state, local, transit, zoo, hospital, highways, county option or resort sales tax.

Textbooks for Higher Education

I certify that textbooks purchased are required for a higher education course, for which I am enrolled at an institution of higher education, and qualify for this exemption. An institution of higher education means: the University of Utah, Utah State University, Utah State University Eastern, Weber State University, Southern Utah University, Snow College, Dixie State University, Utah Valley University, Salt Lake Community College, or the Utah System of Technical Colleges.

* **Purchaser must provide sales tax license number in the header on page 1.**

NOTE TO PURCHASER: You must notify the seller of cancellation, modification, or limitation of the exemption you have claimed.

Questions? Email taxmaster@utah.gov, or call 801-297-2200 or 1-800-662-4335.

SECTION 00 7000
GENERAL CONDITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. **Owner's General Conditions of the Contract for Construction**, dated 01/2016, follow this cover page.

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INTERMOUNTAIN HEALTHCARE
GENERAL CONDITIONS

January 2016

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ARTICLE 1 GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

A/E. □A/E□ means the person lawfully licensed to practice architecture or engineering or an entity lawfully practicing architecture or engineering identified as such in the A/E's Agreement and is referred to throughout the Contract Documents as if singular in number. The term □A/E□ also means the A/E's representative and its subconsultants. When these General Conditions are part of a Contract in which the design professional is an interior designer, landscape subconsultant or other design professional, the term □A/E□ as used in these General Conditions shall be deemed to refer to such design professional. A license is not required when the type of design professional is one which is not subject to a professional license, but such professional must meet the prevailing standards in the State of Utah for such practice. For projects where there is no A/E hired by Intermountain, the references in the General Conditions to A/E shall be deemed to refer to Intermountain as may be practicably applied.

A/E's AGREEMENT. □A/E's Agreement□ means, unless the context requires otherwise, the agreement executed by the A/E and Intermountain for the Project.

ADDENDA. □Addenda□ means the written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the bidding documents or the Contract Documents.

ASI. □ASI□ shall mean a Supplemental Instruction issued by the A/E to the Contractor which may result in clarifications or minor changes in the Work and does not affect the contract time or the contract amount.

BID. □Bid□ means the offer of the bidder submitted on the prescribed form setting forth the proposed stipulated sum for the Work to be performed.

BONDS. □Bonds□ mean the bid bond, performance and payment bonds and other instruments of security

CHANGE ORDER. □Change Order□ means a written instrument signed by Intermountain and Contractor, stating their agreement for changes of the Contract as specified on the required Intermountain change order form.

CLAIM. □Claim□ means a dispute, demand, assertion or other matter arising in connection with the Contract or the Project, whether submitted by Intermountain or the Contractor, including a Subcontractor at any tier subject to the provisions of these General Conditions. A requested amendment, requested change order, or a Construction Change Directive (CCD) is not Claim unless agreement cannot be reached and the procedures of these General Conditions are followed.

CM/GC. □CM/GC□ means the Construction Manager/General Contractor, whether a person or entity, identified in the CM/GC Agreement, and is referred to throughout the Contract

Documents as if singular in number. The term "CM/GC" means the CM/GC or its authorized representative.

CM/GC AGREEMENT. "CM/GC Agreement" means, if applicable, the agreement executed by the CM/GC and Intermountain for the Project.

CONSTRUCTION CHANGE DIRECTIVE. A "Construction Change Directive" or "CCD" means a written order signed by Intermountain, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. Intermountain may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions; even if it may impact the Contract Sum and Contract Time.

CONTRACT. The Contract Documents form the Contract for Construction. The term "Contract" represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the A/E and Contractor, (2) between Intermountain and a Subcontractor or (3) between any persons or entities other than Intermountain and Contractor. The Contract may be amended or modified only by (1) a written amendment executed by both Intermountain and Contractor, or (2) by a Modification.

CONTRACT DOCUMENTS. The term "Contract Documents" means the Contractor's Agreement between Intermountain and Contractor (hereinafter referred to as "Contractor's Agreement"), the Conditions of the Contract (General, Supplementary and other Conditions), the Drawings, Specifications, Addenda, other documents listed in the Contractor's Agreement and Modifications issued after execution of the Contractor's Agreement. The Contract Documents shall also include the bidding/proposal documents, including the Instructions to Bidders/Proposers, Notice to Contractors, the Bid/Proposal Form, and/or the response to the request for proposal, to the extent not in conflict with the other above-stated Contract Documents and other documents and oral presentations as part of the Selection which are documented as an attachment to the Contract.

CONTRACT SUM. The term "Contract Sum" means the Contract Sum as stated in the Contractor's Agreement and, including authorized and signed adjustments to this agreement (modifications), is the total amount payable by Intermountain to the Contractor for performance of the Work under the Contract Documents.

CONTRACT TIME. "Contract Time," unless otherwise provided in the Contract Documents, means the period of time, including authorized and signed adjustments (modifications), stated in the Contract Documents for Substantial Completion of the Work.

CONTRACTOR. The Contractor is the person or entity identified as such in the Contractor's Agreement or the CM/GC Agreement, as applicable, and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative. When separate contracts are awarded for different

portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case, shall mean the Contractor who executes each separate Contractor's or CM/GC Agreement, as applicable.

CONTRACTOR'S AGREEMENT. "Contractor's Agreement" means, unless the context requires otherwise, the stipulated sum agreement executed by the Contractor and Intermountain for the Project.

DAY. The term "day" or "days" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

DEFECTIVE. "Defective" is an adjective which when modifying the word "Work" refers to Work that does not conform to the Contract Documents, or does not meet the requirements of any inspection, referenced standard, code, test or approval referred to in the Contract Documents, or has been damaged.

DIRECTOR. "Director" means Intermountain's Director of Facility Planning and Development unless the context requires otherwise. Director may include a designee selected by the Director for the particular function referred to in the General Conditions.

DRAWINGS. The "Drawings" are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, and generally include the drawings, elevations, sections, details, schedules and diagrams.

INTERMOUNTAIN. "Intermountain" means IHC Health Services, Inc. operating through its Department of Facility Planning and Development. Unless the context requires otherwise, Intermountain is the "Owner" as that term is commonly referred to in the construction industry.

INTERMOUNTAIN/OWNER'S REPRESENTATIVE. The "Intermountain Representative" or "Owner's Representative" is the person (also referred to as the "Project Manager") assigned by the Director to manage the Project and is the sole person authorized to act on behalf of Intermountain under this Agreement.

INSPECTION. The word "inspection" or its derivatives shall mean a review of the Project, including but not limited to a visual review of the Work completed to date to ascertain if the Work is in accordance with the Contract Documents, including all applicable building codes and construction standards.

INVITATION TO BID. "Invitation to Bid" means Intermountain's solicitation or request to a contractor to provide a Bid.

MODIFICATION. A "Modification" is (1) a Change Order (2) Construction Change Directive or (3) ASI.

NOTICE TO PROCEED. A "Notice to Proceed" is a document prepared by Intermountain and by its terms authorizes the Contractor to commence Work on the Project. It is deemed issued

upon being sent by Intermountain to the Contractor's specified address within the Bid or Proposal.

PARTIAL USE. □Partial Use□means placing a portion of the Work in service for the purpose for which it is intended (or a related purpose) before reaching Substantial Completion for all the Work. This partial use does not constitute □substantial completion.□

PRODUCT DATA. □Product Data□means illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

PROJECT. The □Project□means the total construction of the Work performed under the Contract Documents.

PROJECT MANUAL (FOR CONSTRUCTION). The □Project Manual□is the volume of assembled Specifications for the Work and may include the bidding/proposal requirements, sample forms, General or Supplementary Conditions of the Contract.

PROPOSAL. □Proposal□means the A/E's or CM/GC's response to Intermountain's Request for Proposal.

PROPOSAL REQUEST OR □PR.□ A □Proposal Request□or □PR□is a proposal request filed with the Contractor for the purposes of seeking a proposal in order to resolve an issue as part of the Change Order or Contract Modification process.

PROPOSED CHANGE ORDER. A □Proposed Change Order□(□PCO□), is an informal request by the Contractor filed with Intermountain Representative, in an effort to commence the Contract Modification Process. It shall not be considered a □Claim.□The PCO may be related to any potential, or actual delay, disruption, unforeseen condition or materials or any other matter in which the Contractor intends to seek additional monies or time.

REQUEST FOR INFORMATION or RFI. A □Request for Information□or □RFI□is a request filed by the Contractor with the A/E regarding any request for information, direction or clarification related to the Contract Documents, plans or specifications.

REQUEST FOR PROPOSAL or RFP. □Request for Proposal□or □RFP□means Intermountain's solicitation for A/E or CM/GC Proposals.

SALES TAX and/or USE TAX. Sales Tax and/or Use Tax, unless the context requires otherwise, shall mean the sales tax and/or use tax collected or to be collected by the Utah State Tax Commission and shall include any sales and/or use tax that the Utah State Tax Commission collects on behalf of any special district, local government or political subdivision. Intermountain is a sales-tax exempt entity for materials supplied to the Project and will provide a Utah State Tax Commission Exemption Certificate to the Contractor.

SAMPLES. □Samples□mean physical examples, which illustrate materials, equipment or workmanship and establishes standards by which the Work will be judged.

SHOP DRAWINGS. [Shop Drawings] means drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

SPECIFICATIONS. The [Specifications] are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards, installation and workmanship for the Work, and performance of related systems and services.

SUBCONTRACTOR. [Subcontractor] means the person or entity that has a direct contract with the Contractor, including any trade contractor or specialty contractor, or with another Subcontractor at any tier to provide labor or materials for the work but does not include suppliers who provide only materials, equipment or supplies to a contractor or subcontractor. Notwithstanding the foregoing, the text in which the term is used may provide for the exclusion of Subcontractors of other Subcontractors or the exclusion of suppliers. The term [Subcontractor] is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or authorized representative of the Subcontractor. The Term [Subcontractor] does not include a separate contractor or subcontractors of a separate contractor.

SUBSTANTIAL COMPLETION. Substantial Completion is the date certified in accordance with Article 9.2 and means the date the Work or designated portion thereof is sufficiently complete, and any lack of completion or performance does not reasonably interfere with Intermountain's intended use of the Project, in accordance with the Contract Documents so that Intermountain can occupy and use the Work for its intended use.

WORK. The term [Work] means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all labor, materials, equipment and services provided, or to be provided, by the Contractor to fulfill the Contractor's obligations.

ARTICLE 2 INTERMOUNTAIN

2.1 INFORMATION AND SERVICES REQUIRED OF INTERMOUNTAIN

2.1.1 INTERMOUNTAIN'S REPRESENTATIVE. Intermountain shall designate an Intermountain Representative authorized to act in Intermountain's behalf with respect to the Project. Intermountain or such authorized representative shall render decisions within a reasonable time pertaining to documents submitted by the A/E and/or Contractor in order to avoid a compensable delay in the orderly and sequential progress of the Project.

2.1.2 SPECIALISTS AND INSPECTORS. Intermountain will provide certified building inspection services in accordance with the adopted Building Codes. This includes 'routine' and 'special' inspections unless otherwise noted in the A/E Agreement. Intermountain may assign an inspector or specialist to note deviations from, or necessary adjustments to, the Contract Documents or to report deficiencies or defects in the Work. The inspector or specialist's activities in no way relieve the Contractor of the responsibilities set forth in the Contract Documents.

2.1.3 SURVEYS AND LEGAL DESCRIPTION. Intermountain shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall review this information, including the surveys and any provided geotechnical studies, and compare such information with observable physical conditions and the Contract Documents.

2.1.4 PROMPT INFORMATION AND SERVICES. Upon receipt of a written request from the Contractor, Intermountain shall furnish information or services under Intermountain's control with reasonable promptness to avoid delay in the orderly progress of the Work.

2.1.5 COPIES OF DRAWINGS AND PROJECT MANUALS (FOR CONSTRUCTION). Unless otherwise provided in the Contract Documents, the Contractor will be furnished electronic copies of Drawings and Project Manuals for Contractor's use in connection with the execution of the Work for the Project.

2.1.6 OTHER DUTIES. The foregoing is in addition to other duties and responsibilities of Intermountain enumerated herein and especially those in respect to Article 2.2 (Construction by Intermountain or by Separate Contractors), Article 8 (Payments and Completion) and Article 10 (Insurance and Bonds).

2.2 CONSTRUCTION BY INTERMOUNTAIN OR BY SEPARATE CONTRACTORS

2.2.1 INTERMOUNTAIN'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS.

(1) **IN GENERAL.** Intermountain reserves the right to perform construction or operations related to the Project with Intermountain's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver or subrogation.

(2) **COORDINATION AND REVISIONS.** Intermountain shall provide for coordination of the activities of Intermountain's own forces and of each separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and Intermountain in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule and Contract Sum deemed necessary after a joint review and agreement by Intermountain. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and Intermountain until subsequently revised.

2.2.2 MUTUAL RESPONSIBILITY

(1) **CONTRACTOR COORDINATION.** The Contractor shall afford Intermountain and separate contractor(s) a reasonable opportunity for delivery and storage of their materials and equipment and performance of their activities and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

(2) **REPORTING PROBLEMS TO INTERMOUNTAIN.** If part of the Contractor's Work depends on work by Intermountain or a separate contractor, the Contractor

shall, prior to proceeding with that portion of the Work, promptly report in writing to Intermountain apparent defects in workmanship that would render it unsuitable for proper execution. Failure of the Contractor to make said report shall constitute an acknowledgment that Intermountain's or separate contractors completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects in workmanship not then reasonably discoverable.

(3) **COSTS.** Costs caused by delays or by improperly timed activities or defective construction shall be borne by the responsible party in accordance with the procedures and provisions of the Contract Documents.

(4) **CONTRACTOR REMEDIAL WORK.** The Contractor shall promptly remedy damage caused by the Contractor to completed or partially completed Work or to property of Intermountain or separate contractors and subcontractors as provided in Article 6.

ARTICLE 3

A/E

3.1 A/E'S ADMINISTRATION OF THE CONTRACT

3.1.1 IN GENERAL. The A/E assists Intermountain with the administration of the Contract as described in the Contract Documents. The A/E shall have the authority to act on behalf of Intermountain only to the extent provided in the Contract Documents or A/E's Agreement.

3.1.2 SITE VISITS

(1) Site visits or inspections by the A/E, Intermountain or any Intermountain representative shall in no way limit or affect the Contractor's responsibility to comply with all the requirements and the overall design concept of the Contract Documents as well as all applicable laws, statutes, ordinances, resolutions, codes, rules, regulations, orders and decrees.

(2) **WRITTEN REPORT.** The A/E shall promptly submit to Intermountain a written report subsequent to each site visit.

3.1.3 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION. Except as authorized by the Intermountain Representative or as otherwise provided in the Contract Documents, including these General Conditions, the A/E and Contractor shall communicate through the Intermountain Representative on issues regarding the timing of the Work, cost of the Work or scope of the Work. Contractor shall comply with communication policies agreed upon at any pre-construction meeting with Intermountain. Communications by and with the A/E sub-consultants shall be through the A/E. Communications by and with Subcontractors shall be through the Contractor. Communications by and with separate contractors shall be through Intermountain.

3.1.4 A/E MAY REJECT WORK, ORDER INSPECTION, TESTS. The A/E shall have the responsibility and authority to reject Work which, based upon the A/E's knowledge or what may be reasonably inferred from the A/E's site observations and review of data, does not conform to the Contract Documents. Whenever the A/E considers it necessary or advisable for implementation of the intent of the Contract Documents, the A/E shall have the responsibility and authority to require additional inspections or testing of the Work in accordance with the

provisions of the Contract Documents, whether or not such Work is fabricated, installed or completed, provided, however, the A/E must obtain Intermountain's prior written approval of any such additional inspections or testing. However, neither this authority of the A/E nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the A/E to the Contractor, Subcontractors, their agents or employees or other persons performing portions of the Work, including separate contractors. If the Contractor disputes the rejection of any Work and the correction thereof shall involve additional cost or time, it shall be Intermountain's option to accept such Work whether it be conforming or nonconforming.

3.1.5 A/E REVIEW CONTRACTOR'S SUBMITTALS

(1) Contractor shall submit shop drawings, product data, and samples and other submittals required by the Contract Documents to the A/E as required by the approved submittal schedule.

(2) The A/E shall review and approve or take other appropriate action upon Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the purpose of checking for conformance with the information and design concepts expressed in the Contract Documents. A/E action taken on a submittal shall not constitute a Modification of this Agreement.

(3) The A/E's action shall be taken no later than 15 days following A/E's receipt of the submittal, unless agreed to otherwise by Contractor and Intermountain, in order to avoid a delay in the Work of the Contractor or of separate contractors while allowing sufficient time in the A/E's professional judgment to permit adequate review.

(4) Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents.

(5) The A/E's review of the Contractor's submittals shall not relieve the Contractor of the obligations under the Contract Documents.

(6) The A/E's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the A/E, of any construction means, methods, techniques, sequences or procedures.

(7) The A/E's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

(8) When professional certification of performance characteristics of materials, systems or equipment is required by the Contract Documents, the A/E shall be entitled to rely upon such certifications to establish that the materials systems or equipment will meet the performance criteria required by the Contract Documents.

3.2 OWNERSHIP AND USE OF A/E'S DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS. All Drawings, Specifications and other documents prepared by the A/E are and shall remain the property of Intermountain, and Intermountain shall retain all common law, statutory and other reserved rights with respect thereto. Said documents were

prepared and are intended for use as an integrated set for the Project which is the subject of this Contractor's Agreement. The Contractor shall not modify or use Contract Documents on any other project without the prior written consent of Intermountain and A/E. Any such non-permissive use or modification, by Contractor, the Contractor's Subcontractors at any tier or anyone for whose acts the Contractor is liable, shall be at Contractor's sole risk. Contractor shall hold harmless and indemnify Intermountain from and against any and all claims, actions, suits, costs, damages, loss, expenses and attorney fees arising out of such non-permissive use or modification by the Contractor. The Contractor and Subcontractors are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the A/E appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this license shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the A/E. Submittals or distributions necessary to meet official regulatory requirements or for other purposes relating to completion of the Project are not to be construed as a publication in derogation of Intermountain's copyright or other reserved rights.

ARTICLE 4 CONTRACTOR

4.1 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

4.1.1 REVIEWING CONTRACT DOCUMENTS, INFORMATION, REPORTING ERRORS, INCONSISTENCIES OR OMISSIONS. The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by Intermountain pursuant to Article 2.1 hereinabove and shall at once report to Intermountain and A/E errors, inconsistencies or omissions discovered. The Contractor shall not be liable to Intermountain or A/E for damage resulting from errors, inconsistencies or omission in the Contract Documents, unless the Contractor recognized such error, inconsistency or omission or a Contractor of ordinary skill and expertise for the type of Work involved would have readily so recognized such error, inconsistency or omission, and the Contractor failed to report such to Intermountain and A/E. If the Contractor performs any construction activity without such notice to Intermountain and A/E and prior to the resolution of the error, inconsistency or omission, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.

4.1.2 FIELD CONDITIONS. The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor, or information which a Contractor of ordinary skill and expertise for the type of Work involved would have known, before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to Intermountain and A/E at once. If the Contractor performs any construction activity without such notice to Intermountain and A/E and prior to the resolution of the error, inconsistency or omission, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.

4.1.3 PERFORM IN ACCORDANCE WITH CONTRACT DOCUMENTS AND SUBMITTALS. The Contractor shall perform the Work in accordance with the Contract Documents and submittals approved in accordance with the Contract Documents

4.1.4 PERFORMANCE TO PRODUCE THE COMPLETE SYSTEM AND INTENDED RESULTS. Performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable from the Contract Documents as being necessary to allow the system to function within its intended use.

4.1.5 INTENT AND HIERARCHY. The Contract Documents should be read as a whole and wherever possible, the provisions should be construed in order that all provisions are operable. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complimentary, and what is required by one Document or provisions thereof shall be as binding as if required by all the Documents or provisions thereof. In case of an irreconcilable conflict between provisions within a Contract Document or between Contract Documents, the following priorities shall govern as listed below:

(1) A particular Modification shall govern over all Contract Document provisions or Modifications issued prior to said particular Modification.

(2) Attachments to the Contractor's Agreement resulting from the Selection process including any management plan or documented interview information shall govern over addenda, the General Conditions, plans and specifications.

(3) A particular Addendum shall govern over all other Contract Document provisions issued prior to said particular Addendum. Subsequent Addenda shall govern over all prior Addenda.

(4) The Supplementary General Conditions shall govern over the General Conditions.

(5) These General Conditions shall govern over all other Contract Documents except for the Supplementary General Conditions, Addenda, Modifications and Attachments resulting from the selection process.

(6) The drawings and specifications shall not govern over any of the documents listed above.

(7) In case of a conflict or ambiguity within the same level of hierarchy of described documents, Intermountain reserves the right to select the most stringent requirement unless the preponderance of the contract indicates the less stringent requirement.

4.1.6 DIVIDING WORK AND CONTRACTOR REPRESENTATION. Organization of the specifications into divisions, sections and articles, and arrangement of Drawings, shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. Contractor represents that the Subcontractors, Sub-subcontractors, manufacturers and suppliers engaged or to be engaged by it are and will be familiar with the requirements for performance by them of their obligations.

4.1.7 PLANNING AND PRIORITY. The Contractor shall plan and schedule its work to facilitate the Project and shall maintain a work schedule to place proper priority to sequence work to complete the project timely.

4.2 SUPERVISION AND CONSTRUCTION PROCEDURES

4.2.1 SUPERVISION AND CONTROL. The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over the construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, except to the extent that the Contract Documents expressly and specifically state otherwise.

4.2.2 RESPONSIBILITY. The Contractor shall be responsible to Intermountain for acts and omissions of the Contractor's employees, Subcontractors, and their agents and employees, and other persons performing portions of the Work under a contract with the Contractor or on behalf of the Contractor.

4.2.3 NOT RELIEVED OF OBLIGATIONS. The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of Intermountain or its agents in Intermountain's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor or for those that the Contractor is liable.

4.2.4 INSPECTIONS AND APPROVALS

(1) The Contractor is responsible for requesting inspections for various stages and portions of the Work required under the Contract Documents in a timely manner.

(2) If any of the Work is required to be inspected or approved by the terms of the Contract Documents by any public authority, the Contractor shall timely request such inspection or approval to be performed in accordance with Article 9. Except as provided in Article 9, work shall not proceed without any required inspection and the associated authorization to proceed. Contractor shall promptly notify Intermountain if the inspector fails to appear at the site.

4.3 LABOR AND MATERIALS

4.3.1 PAYMENT BY CONTRACTOR. Except to the extent it is otherwise stated in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities, supplies, consumables and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

4.3.2 DISCIPLINE AND COMPETENCE. The Contractor shall enforce strict discipline and good order among the Contractor's employees, its Subcontractors, agents, representatives and other persons performing under the Contract Documents. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

4.4 TAXES AND OTHER PAYMENTS TO GOVERNMENT. The Contractor shall pay sales, consumer, use, employment-related and similar taxes related to the Work or portions

thereof provided by the Contractor which are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect, and shall comply with the laws and regulations regarding the payment of Sales and/or Use Tax and any exemptions; provided that, Intermountain is a sales-tax exempt entity for materials supplied to the Project and will provide a Utah State Tax Commission Exemption Certificate to the Contractor.

4.5 PERMITS, FEES, NOTICES, LABOR AND MATERIALS

4.5.1 PERMITS AND FEES. Unless required in the Supplementary General Conditions or an Addendum, it will not be necessary for the Contractor to obtain or pay for local building permits, plan check fees, electrical permits, plumbing permits, connection fees, or impact fees, nor will it be necessary to pay fees for inspections pertaining thereto.

4.5.2 COMPLIANCE WITH PUBLIC AUTHORITIES, NOTICES. The Contractor shall comply with and give notices required by laws, ordinances, resolutions, rules, regulations and lawful orders of public authorities bearing on the performance of the Work.

4.5.3 CORRELATION OF CONTRACT DOCUMENTS AND ENACTMENTS. It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, resolutions, building codes, and rules and regulations. Notwithstanding this, if the Contractor observes, or if such is readily observable to a Contractor of ordinary skill and expertise for the type of Work involved, that a portion of the Contract Documents is at variance therewith, the Contractor shall promptly notify the A/E and Intermountain in writing, and necessary changes shall be accomplished by appropriate Modification.

4.5.4 FAILURE TO GIVE NOTICE. If the Contractor, or any Subcontractor thereof performs Work without complying with the requirements of this Article 4.5 hereinabove, the Contractor shall assume appropriate responsibility for such Work and shall bear the appropriate amount of the attributable costs.

4.6 SUPERINTENDENT. The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site at all times during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

4.7 TIME AND CONTRACTOR'S CONSTRUCTION SCHEDULES

4.7.1 PROGRESS AND COMPLETION

(1) **TIME IS OF THE ESSENCE; COMPLETE WITHIN CONTRACT TIME.** Time is of the essence. By executing the Contractor's Agreement, the Contractor confirms that the Contract Time is adequate to perform the Work. The Contractor shall proceed expeditiously with adequate forces to achieve Substantial Completion within the Contract Time.

(2) **NOTICE TO PROCEED AND INSURANCE.** The Contractor shall not prematurely commence operations on the site or elsewhere prior to the issuance of a Notice to

Proceed by Intermountain or prior to the effective date of insurance required by Article 10 to be furnished by the Contractor, whichever is the latter.

4.7.2 SCHEDULE PREPARATION. The Contractor, promptly after being awarded the Contract, shall prepare and submit for Intermountain's and A/E's review, a reasonably detailed CPM schedule for the Work. The schedule shall indicate the order, sequence, and interdependence of all items known to be necessary to complete the Work including construction, procurement, fabrication, and delivery of materials and equipment, submittals and approvals of samples, shop drawings, procedures, or other documents. Work items of Intermountain, other Contractors, utilities and other third parties that may affect or be affected by the Contractor shall be included. If Intermountain is required, by the Contract Documents, to furnish any materials, equipment, or the like, to be incorporated into the Work by the Contractor, Contractor shall submit, with the first schedule submittal, a letter clearly indicating the dates that such items are required at the Project Site. The critical path should be identified, including the critical paths for interim completion dates and milestones. The CPM schedule shall be developed using Primavera, MS Project, or Suretrack unless otherwise authorized by Intermountain Representative. The Contractor's schedule shall be updated at least once per month and submitted with each pay request. The Contractor shall maintain an original baseline schedule and shall provide Intermountain monthly written reports indicating Contractor's compliance or noncompliance with the original schedule.

4.7.3 INITIAL CONTRACT TIME. Unless otherwise specified in the bidding documents, the initial Contract Time is the time identified in the Contractor's Agreement.

4.7.4 INTERIM COMPLETION DATES AND MILESTONES. The schedule must include contractually specified interim completion dates and milestones. The milestone completion dates indicated are considered essential to the satisfactory performance of this Contract and to the coordination of all Work on the Project. The milestone dates listed are not intended to be a complete listing of all Work under this Contract or of interfaces with other Project Contractors.

4.7.5 SCHEDULE CONTENT REQUIREMENTS. The schedule shall indicate an early completion date for the Project that is no later than the Project's required completion date. The schedule, including all activity duration's shall be given in calendar days. The Schedule shall also indicate all of the following:

- (1) Interfaces with the work of outside contractors (e.g., utilities, power and with any separate Contractor);
- (2) Description of activity including activity number/numbers;
- (3) Estimated duration time for each activity;
- (4) Early start, late start, early finish, late finish date, and predecessor/successors including stop-start relationships with lead and lag time for each activity;
- (5) Float available to each path of activities;
- (6) Actual start date for each activity begun;
- (7) Actual finish date for each activity completed;

(8) The percentage complete of each activity in progress or completed;

(9) Identification of all critical path activities;

(10) The critical path for the Project, with said path of activities being clearly and easily recognizable on the time-scaled network diagram. The path(s) with the least amount of float must be identified. Unless otherwise authorized by Intermountain Representative, no more than 40% of all activities may be identified as critical path items. The relationship between non-critical activities and activities on the critical path shall be clearly shown on the network diagram;

(11) Unless otherwise authorized by Intermountain Representative, all activities on the schedule representing construction on the site may not have duration longer than 14 days. Construction items that require more than 14 days to complete must be broken into identifiable activities on the schedule with durations less than 14 days. The sum of these activities represents the total length required to complete that construction item; and

(12) Additional requirements as specified in the Supplemental General Conditions.

4.7.6 INTERMOUNTAIN'S RIGHT TO TAKE EXCEPTIONS. Intermountain reserves the right to take reasonable exception to activity duration, activity placement, construction logic or time frame for any element of the Work to be scheduled.

4.7.7 FLOAT TIME. Float or slack time is defined as the amount of time between the earliest start date and the latest start date or between the earliest finish date and the latest finish date of a chain of activities on the Schedule. By a proposal request or modification delivered to the Contractor, Intermountain has the right to use the float time for non-critical path activities until the Contractor has reallocated such time on a newly submitted schedule.

4.7.8 INITIAL SCHEDULE SUBMISSION. No progress payments will be approved until the Contractor has submitted a Project detailed CPM schedule for the entire project.

4.7.9 UPDATES. Prior to any approval of a pay request, Intermountain, A/E and Contractor shall review the Contractor's schedule compared to the Work completed. Intermountain approves the amount of Work completed as supported by the schedule of values and as verified by the determination of Work completed. If necessary, the Contractor shall then update and submit to Intermountain the schedule with the pay request; all of which in accordance with Intermountain's approval. All updates shall be provided in electronic and hard copy formats. At each scheduled meeting with Intermountain Representative, the Contractor shall provide a "three week look ahead" with long lead items identified.

4.7.10 SCHEDULE OF SUBMITTALS. The Contractor shall prepare and keep current, for the A/E's and Intermountain's review, a schedule of submittals required under the Contract Documents which is coordinated with the Contractor's construction schedule and allows the A/E a reasonable time to review the submittals. This submittal schedule is to be included as part of the construction schedule. Submittals requiring expedited review must be clearly identified as such in the schedule of submittals.

4.7.11 SCHEDULE RECOVERY. If the Work represented by the critical path falls behind by more than 7 days, the project schedule shall be redone within 14 days showing how

the Contractor shall recover the time. A narrative that addresses the changes in the schedule from the previously submitted schedule shall be submitted along with the schedule in both hard copy (appropriate report formats to be determined by Intermountain Representative) and electronic copy. The Contractor shall comply with the most recent schedules.

4.7.12 SCHEDULE CHANGES AND MODIFICATIONS.

(1) **CONTRACT TIME CHANGE REQUIRES MODIFICATION.** The Contract Time may only be shortened or extended by a written modification fully executed by Intermountain.

(2) **CONTRACTOR CHANGING ACTIVITY DURATIONS.** Should the Contractor, after approval of the complete detailed construction schedule, desire to change his plan of construction, he shall submit his requested revisions to Intermountain and the A/E along with a written statement of the revisions including a description of the sequence and duration changes for rescheduling the work, methods of maintaining adherence to intermediate milestones and the contract completion date and the reasons for the revisions. If the requested changes are acceptable to Intermountain, which acceptance shall not be unreasonably withheld, they will be incorporated into the Schedule in the next reporting period. If after submitting a request for change in the Contract Schedule, Intermountain does not agree with the request, Intermountain will schedule a meeting with the Contractor to discuss the differences.

(3) **CHANGES IN CONTRACT TIME.** The critical path schedule as the term is used in the provisions herein shall be based on the current version of the Contractor's schedule for the Project and accepted by Intermountain just prior to the commencement of the modification, asserted delay, suspension or interruption. If the Contractor believes it is entitled to an extension of Contract Time under the Contract Documents, the Contractor shall submit a PCO in accordance with Article 7.2 to the A/E and Intermountain Representative accompanied by an analysis of the requested time adjustment.

4.7.13 EXCUSABLE DELAY

(1) **IN GENERAL.** If the Contractor is delayed at any time in the progress of the Work on the critical path schedule by an act or neglect of Intermountain or other causes beyond the Contractor's control or by other causes which Intermountain determines may justify delay, then the Contract Time shall be extended by Change Order. The Contractor shall immediately take all steps reasonably possible to lessen the adverse impact of such delay. Notwithstanding the above, to the extent any of the causes for delay were caused by the Contractor, reasonably foreseeable by the Contractor or avoidable by the Contractor, then to such extent the delay shall not be cause for extension of the Contract Time. For purposes of this paragraph, Contractors shall include all subcontractors and others under the responsibility of the Contractor.

The determination of the total number of days' extension will be based upon the current construction schedule in effect at the inception of the change and/or delay and upon all data relevant to the extension as it exists in the project record. Once approved, such data shall be incorporated in the next monthly update of the schedule.

Contractor acknowledges and agrees that delays in work items which, according to the schedule analysis, do not affect any milestone dates or the Contract completion dates shown on the CPM at the time of the delay, will not be the basis for a contract extension.

(2) **WEATHER-RELATED EXCUSABLE DELAYS.** Completion time will not be extended for normal bad weather or any weather that is reasonably foreseeable at the time of entering into the contract. The time for completion as stated in the contract documents includes due allowance for calendar days on which Work cannot be performed out of doors. The Contractor acknowledges that it may lose days due to weather conditions. Contract time may be extended at no cost to Intermountain if all of the following are met which must be established by the Contractor:

- (a) That the weather prevented Work from occurring that is on the critical path for the project based upon a critical path schedule previously submitted to Intermountain and to the extent accepted by Intermountain;
- (b) There are no concurrent delays attributed to the Contractor;
- (c) The Contractor took all reasonable steps to alleviate the impact of the weather and took reasonable attempts to prevent the delay and despite such reasonable actions of Contractor, the weather impacted the critical path as described above; and
- (d) One of the following occurred:
 - 1. The weather was catastrophic, such as a tornado, hurricane, severe wind storm, severe hail storm; or
 - 2. Based on the full history of information published from the closest station as indicated from the Western Regional Climate Center (Desert Research Institute 2215 Raggio Parkway Reno, Nevada 89512, and as may be described on the website at <http://www.wrcc.dri.edu/summary/>), one or more of the following occurred:
 - a. For any day between November 1 and March 31, the minimum temperature fell below the average minimum temperature plus the extreme low temperature recorded for the month divided by 2.
 - b. For any day between November 1 and March 31, the maximum temperature fell below the monthly average for the minimum temperature.
 - c. The daily precipitation exceeded 75% of the historical one day maximum for the month.
 - d. The snowfall for the month exceeded 175% of the historical average snow fall for the month.

4.7.14 COMPENSABLE DELAY, SUSPENSION OR INTERRUPTION

(1) **BASIC CONDITIONS.** In addition to the other requirements of the Contract Documents, a compensable delay, suspension or interruption of the work occurs only when the following are met:

(a) Is wholly unanticipated by the parties at the time of execution of the Contractor's Agreement or is caused by the breach of a fundamental obligation of the Contract Documents attributable to Intermountain; and

(b) The Contractor delivers a written notice to A/E and Intermountain within seven (7) days that the Contractor knows or should have known of the condition giving rise to the purported compensable delay, disruption, suspension or interruption, and said continuation affects the Contract Time as indicated by the last submitted and reasonable critical path schedule.

(2) **COMPENSABLE DELAY FORMULA.** To the extent of the compensable delay, the Contractor's total entitlement for all compensable delay damages is the computed result of the following formula: Contract Sum divided by Contract Time (in calendar days); the result of which is then multiplied by 0.05; and the result of which is multiplied by the number of calendar days of compensable days allowed under these General Conditions that are beyond the Contract Time. Notwithstanding any other provision of these General Conditions or the Contract Documents, to the extent the Contractor is entitled to receive the 10% or 15% markup under Article 7.4, this provision shall be inapplicable and the markup shall be deemed to include all the compensable delay damages provided by this paragraph.

(3) **PERIOD OF COMPENSABLE DELAY, SUSPENSION OR INTERRUPTION.** The length and extent of compensable delay, shall be determined, with the use of the Project's critical path schedule, by ascertaining the number of additional days to the Contract Time that are needed in order to perform the Work in accordance with the Contract Documents as a result of the continuation of the aforesaid delay, disruption, suspension or interruption after receipt of the written notice received by the A/E and Intermountain under Section 4.7.14(1)(b) above.

(4) **CONCURRENT DELAY.** Notwithstanding any other provision of these General Conditions, to the extent a non-compensable delay occurs at the same time as a compensable delay, Intermountain shall not be responsible for any compensation for the period of the non-compensable delay.

4.7.15 TIME EXTENSION REQUEST. Any time extension shall be requested within 21 days after the Contractor knew or should have known about the delay and shall be supported by the critical path schedule analysis.

4.7.16 LIQUIDATED DAMAGES

(1) **IN GENERAL.** Should the Contractor fail to complete the Work within the Contract Time, there shall be deducted from any amount due or that may become due the Contractor, the sum, if any, stated in the Contractor's Agreement. Such sum is fixed and agreed upon by Intermountain and Contractor as liquidated damages due Intermountain by reason of the inconvenience and added costs of administration, engineering, supervision and other costs resulting from the Contractor's default, and not as a penalty. Actual damages related to delay cannot be ascertained at the time of execution of the Contract. To the extent that the liquidated

damages exceed any amounts that would otherwise be due the Contractor, the Contractor shall be liable for such excess to Intermountain. Intermountain may seek enforcement of such obligation by legal action, and if such is necessary, shall recover the related costs and attorney fees. Notwithstanding any other provision of these General Conditions, the availability of liquidated damages to Intermountain shall not limit Intermountain's right to seek damages or other remedies available under law or equity to the extent such damages or remedies are not based upon delay.

(2) **NO WAIVER OF INTERMOUNTAIN'S RIGHTS.** Permitting the Contractor to continue any part of the Work after the time fixed for completion or beyond any authorized extension thereof, shall in no way operate as a waiver or estoppel on the part of Intermountain of any of its rights under the Contract Documents, including the right to liquidated damages or any other remedies or compensation.

4.8 DOCUMENTS AND SAMPLES AT THE SITE, CERTIFYING AS-BUILTS
The Contractor shall maintain at the site for Intermountain, one record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked weekly to record changes and selections made during construction, as well as approved Shop Drawings, Product Data, Samples and similar submittals. These aforesaid items shall be available to the A/E and shall be delivered to the A/E for submittal to Intermountain upon completion of the Work, signed by the Contractor, certifying that they show complete and exact as-builtconditions, stating sizes, kind of materials, vital piping, conduit locations and similar matters. All notes of encountered or changed conditions shall be included.

4.9 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

4.9.1 NOT CONTRACT DOCUMENTS. Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The submittal shall demonstrate, for those portions of the Work for which the submittal is required, the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents.

4.9.2 PROMPTNESS. The Contractor shall review, approve and submit to the A/E, Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work, or the activities of Intermountain or separate contractors.

4.9.3 NOT PERFORM UNTIL A/E APPROVES. The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved in writing by the A/E. Such Work shall be in accordance with the approved submittals.

4.9.4 REPRESENTATIONS BY CONTRACTOR. By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

4.9.5 CONTRACTOR'S LIABILITY. The Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the A/E's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor

has specifically informed the A/E in writing of such deviation at the time of the submittal and the A/E has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the A/E's review and comment.

4.9.6 DIRECT SPECIFIC ATTENTION TO REVISIONS. The Contractor shall direct specific attention in writing to all revisions on resubmitted Shop Drawings, Product Data, Samples or similar submittals, except those requested by the A/E and indicated on previous submittals.

4.9.7 INFORMATIONAL SUBMITTALS. Informational submittals upon which the A/E is not expected to take responsive action may be so identified in the Contract Documents.

4.9.8 RELIANCE ON PROFESSIONAL CERTIFICATION. When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, Intermountain and A/E shall be entitled to rely upon the accuracy and completeness of such calculations and certifications. If a professional stamp is required, the professional shall be licensed in the State of Utah unless otherwise approved by Intermountain in writing. Likewise, the Contractor is entitled to rely upon the accuracy and completeness of the calculations made by the A/E in developing the Contract Documents, unless a Contractor of ordinary skill and expertise for the type of Work involved would know that such is inaccurate or incomplete and therefore must immediately notify Intermountain in writing.

4.10 USE OF SITE

4.10.1 IN GENERAL. The Contractor shall confine operations at the site to areas permitted by the Contract Documents, law, ordinances, resolutions, rules and regulations, and permits and shall not unreasonably encumber the site with materials or equipment. Contractor shall take all reasonable means to secure the site, protect the site and protect the Work from any damage. The site shall be left free and clear of refuse, equipment, materials, etc. and the site shall not be subject to spilled liquids and chemicals, toxic or otherwise. Should such an incident occur while the Contractor has control of the site, the Contractor shall be responsible to clean the site and pay all associated costs, fines and penalties. Notwithstanding this, Contractor is not responsible for any damage to the site or the Work to the extent caused by Intermountain or Intermountain's agents.

4.10.2 ACCESS TO NEIGHBORING PROPERTIES. The Contractor shall not, except as provided in the Contract Documents or with Intermountain's advance written consent when necessary to perform the Work, interfere with access to properties neighboring the Project site by the owners of such properties and their respective tenants, agents, invitees and guests.

4.11 ACCESS TO WORK. The Contractor shall provide Intermountain and A/E access to the Work in preparation and progress, wherever located.

4.12 ROYALTIES AND PATENTS. The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of patent rights and shall hold Intermountain and A/E harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a patent, the Contractor

shall be responsible for such loss unless such information is promptly furnished to Intermountain in writing.

4.13 INDEMNIFICATION

4.13.1 IN GENERAL

(1) To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless Intermountain and its affiliates, subsidiaries, officers, employees, agents, authorized volunteers (hereinafter the above listing of entities and persons is referred to as **indemnitees**) from and against every kind and character of claims, damages, losses and expenses, including but not limited to attorneys' fees, and including those events covered under the blanket Contractual Liability Coverage required under the Contract Documents, arising out of or resulting from any act or omission in the performance of the Work including the work of all the Subcontractors and their employees, provided that any such claim, damage, loss or expense is caused in whole or in part by the negligent or wrongful act or omission of the Contractor, any Subcontractor, and their employees, provided that any such claim, damage loss or expense is caused in whole or in part by the negligent or intentional act or omission of the Contractor, any Subcontractor, or anyone directly or indirectly employed or the agent of any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. The Contractor shall defend all actions brought upon such matters to be indemnified hereunder and pay all costs and expenses incidental thereto, but Intermountain shall have the right, at its option, to participate in the defense of any such action without relieving the Contractor of any obligation hereunder. Notwithstanding any of the above, to the extent the Contractor is complying with a written directive from Intermountain that is not based on the Contractor's recommendation, the Contractor shall not be held liable under the indemnification provision of this Agreement if the Contractor has promptly disagreed with the written directive by delivering such objection to Intermountain in writing.

(2) Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person under Contract Documents.

(3) In claims against any person or entity indemnified under this Article 4.13 by an employee of the Contractor, Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Article 34.13 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or Subcontractor under workers' or workmen's compensation acts, disability benefits acts or other employee benefit acts.

(4) Intermountain and Contractor waive all rights against each other for damages to the Work during construction to the extent covered by the applicable Builder's Risk Policy, except such rights as they may have to the proceeds of such insurance as set forth in these General Conditions. Contractor shall require similar waivers from its Subcontractors, Subconsultants, and agents at any tier.

ARTICLE 5 SUBCONTRACTORS

5.1 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.1.1 APPROVAL REQUIRED

(1) Listing of Subcontractors shall be as stated in the Contract Documents, including but not limited to the Inter Mountain Subcontractors List Form

(2) The Contractor shall not contract with a proposed person or entity to whom Inter Mountain has made a reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

5.1.2 BUSINESS AND LICENSING REQUIREMENTS. All Subcontractors used by the Contractor shall comply with all applicable business and licensing requirements.

5.1.3 SUBSEQUENT CHANGES. After the bid opening, the Contractor may change its listed Subcontractors only in accordance with the Contract Documents and with written approval of the Director.

(1) Inter Mountain will pay the additional costs for an Inter Mountain requested change in subcontractor if all of the following are met:

- (a) If Inter Mountain in writing requests the change of a subcontractor;
- (b) The original subcontractor is a responsible subcontractor that meets the requirements of the Contract Documents; and
- (c) The original subcontractor did not withdraw as a subcontractor on the project.

(2) In all other circumstances, the Contractor shall pay the additional cost for a change in a subcontractor.

5.1.4 BONDING OF SUBCONTRACTORS. Subcontractors as identified by Inter Mountain in the procurement documents, may be required to submit performance and payment bonds to cover the full extent of their portion of the Work. This provision does not in any way limit the right of the Contractor to have subcontractors at any tier be required to have a performance and/or payment bond.

5.2 SUBCONTRACTUAL RELATIONS

5.2.1 COMPLY WITH CONTRACT DOCUMENTS. By appropriate enforceable agreement, and to the extent it can be practically applied, the Contractor shall require each Subcontractor to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes towards Inter Mountain and A/E.

5.2.2 RIGHTS. Each Subcontractor agreement shall preserve and protect the rights of Inter Mountain and A/E under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the Subcontractor agreement, the

benefit of all rights and remedies against the Contractor that the Contractor, by the Contract Documents, has against Intermountain.

5.2.3 SUB-SUBCONTRACTORS. The Contractor shall require each Subcontractor to enter into similar agreements with its Subcontractors which complies with the requirements of Paragraphs 5.2.1 and 5.2.2 hereinabove.

5.2.4 DOCUMENT COPIES. The Contractor shall make available to each proposed Subcontractor, prior to execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound. Subcontractors shall similarly make copies of applicable portions of the Contract Documents available to their respective proposed Subcontractors.

5.3 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

5.3.1 CONDITIONS FOR ASSIGNMENT TO INTERMOUNTAIN. Each subcontract agreement for a subcontractor at any tier for a portion of the Work is assigned by the Contractor to Intermountain provided that the assignment is effective only after termination of the Contract by Intermountain for cause pursuant to Article 12.2 or stoppage of the Work by Intermountain pursuant to Article 12.5, and only for those subcontract agreements which Intermountain accepts by notifying the Subcontractor in writing. The subcontract shall be equitably adjusted to meet the new conditions of the work.

ARTICLE 6 PROTECTION OF PERSONS AND PROPERTY

6.1 SAFETY OF PERSONS AND PROPERTY

6.1.1 CONTRACTOR RESPONSIBILITY. The Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall take all reasonable precautions for the safety of, and shall provide reasonable protection to prevent damage, injury or loss to:

- (1) Employees on the Work and other persons who may be affected thereby;
- (2) The Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or a Subcontractor; and
- (3) Other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

6.1.2 SAFETY PROGRAM, PRECAUTIONS. The Contractor shall institute a safety program at the start of construction to minimize accidents. Said program shall continue to the final completion of the Project and conform to applicable laws and regulations including the Utah Occupational Safety and Health Rules and Regulations as published by the Utah Industrial Commission - UOSH Division. The Contractor shall post signs, erect barriers, and provide those items necessary to implement the safety program. As soon as the Contractor proceeds with the Work, the Contractor shall have all workers and all visitors on the site wear safety hard hats, as

well as all other appropriate safety apparel such as safety glasses and shoes, and obey all safety rules and regulations and statutes. The Contractor shall post a sign in a conspicuous location indicating the necessity of wearing hard hats and the Contractor shall loan such hats to visitors.

6.1.3 COMPLIANCE WITH LAWS. The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss. In particular, the Contractor shall comply with all applicable provisions of Federal, State and municipal safety laws, rules and regulations as well as building codes to prevent accidents or injury to persons on, about, or adjacent to the premises where the Work is being performed.

6.1.4 ERECT AND MAINTAIN SAFEGUARDS. The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including effective fences, posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

6.1.5 UTMOST CARE. When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

6.1.6 PROMPT REMEDY. The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Paragraph 6.1.1 of these General Conditions caused in whole or in part by the Contractor, a Subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under said Paragraph 6.1.1, except to the extent such damage or loss is directly due to errors in the Contract Documents or caused by agents or employees of the A/E or Intermountain. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under the Contract Documents.

6.1.7 SAFETY DESIGNEE. The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents, damage, injury or loss. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to Intermountain and A/E.

6.1.8 LOAD SAFETY. The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.

6.1.9 OFF-SITE RESPONSIBILITY. In addition to its other obligations under this Article 6, the Contractor shall, at its sole cost and expense, promptly repair any damage or disturbance to walls, utilities, streets, ways, sidewalks, curbs and the property of Intermountain and third parties (including municipalities and other governmental agencies) resulting from the performance of the Work, whether by it or by its Subcontractors at any tier. The Contractor shall not cause materials, including soil and debris, to be placed or left on streets or ways.

6.1.10 EMERGENCIES. In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Contractor shall promptly notify Intermountain Representative of the action taken.

6.2 HAZARDOUS MATERIALS. In the event the Contractor encounters on the site material reasonably believed to be asbestos or polychlorinated biphenyl (PCB) or any other hazardous waste or substance which may endanger the health of those persons performing the Work or being on the site, the Contractor shall immediately stop Work in the area affected and immediately report the condition to Intermountain Representative and A/E by phone with a follow-up document in writing. The Work in the affected area shall be resumed when written direction is provided by Intermountain Representative. Except to the extent provided otherwise in the Contract Documents or if the presence of hazardous materials is due to the fault of the Contractor, the Contractor shall not be required to perform without the Contractor's consent, any Work relating to asbestos, polychlorinated biphenyl (PCB) or any other hazardous waste or substance. Intermountain shall procure a licensed abatement contractor qualified to remove the hazardous material. The abatement contractor shall submit notification of demolition to the Utah Division of Air Quality. Abatement contractor shall pay the notification fee. A copy of the hazardous material survey report shall be available to all persons who have access to the construction site.

6.3 HISTORICAL AND ARCHEOLOGICAL CONSIDERATIONS. In the event the Contractor knows or should have known of any cultural, historical or archeological material that is either recognized as an item to be protected under Federal, State, or local law or regulation, or is an item of obvious value to Intermountain, the Contractor shall cease any work that would interfere with such discovery and immediately report the condition to the Intermountain Representative and A/E by phone with a follow-up document in writing. Work shall resume based upon the direction of Intermountain Representative. Contractor cooperation with any Intermountain recognized archaeologist or other cultural/historical expert is required.

6.4 CONTRACTOR LIABILITY. If the Contractor fails in any of its obligations in Articles 6.1 through 6.3 above, the Contractor shall be liable to any damages to Intermountain or any third party resulting from such noncompliance. The Contractor shall also be liable for any mitigation or restoration effort resulting from such noncompliance. To the extent all the following is met, the Contractor may treat the discovery of such material similarly to an unforeseen condition:

6.4.1 The discovery of such material is reasonably unforeseeable given the site conditions that the Contractor should have been aware;

6.4.2 The presence of such material was not identified in any part of the Contract Documents;

6.4.3 The Contractor has undertaken all proper action to mitigate any impact of such discovery on the critical path or monies related to the Project;

6.4.4 The discovery affects the critical path or contract price from that which was contemplated by the Contract Documents; and

6.4.5 The requirements of 7.1.5 and the Contract documents are met.

ARTICLE 7 MODIFICATIONS, REQUEST FOR INFORMATION, PROPOSED CHANGE ORDER, AND CLAIMS PROCESS

7.1 MODIFICATIONS: IN GENERAL

7.1.1 TYPES OF MODIFICATIONS AND LIMITATIONS. Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or ASI, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents. The Contractor must have a written Modification executed by Intermountain under this Article 7 prior to proceeding with any Work sought to be an extra.

7.1.2 BY WHOM ISSUED. A Change Order or Construction Change Directive shall be issued by Intermountain Representative. An ASI is issued by the A/E. The A/E shall prepare Change Orders and Construction Change Directives with specific documentation and data for Intermountain's approval and execution in accordance with the Contract Documents, and may issue ASIs not involving an adjustment in the contract sum or an extension of the Contract Time which are not inconsistent with the intent of the Contract Documents.

7.1.3 CONTRACTOR TO PROCEED UNLESS OTHERWISE STATED. Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or ASI.

7.1.4 ADJUSTING UNIT PRICES. If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are so changed in a proposed Change Order or Construction Change Directive that application of such unit prices to quantities of Work proposed will cause a substantial inequity to Intermountain or Contractor, the applicable unit prices may be equitably adjusted.

7.1.5 SPECIAL NOTICES REQUIRED IN ORDER TO BE ELIGIBLE FOR ANY CONTRACT MODIFICATION. In order to be eligible for any Modification under this Article 7, the Contractor must have met the following special notice requirements:

(1) **CONCEALED OR UNKNOWN CONDITIONS.** The Contractor must file a written notice with Intermountain Representative within seven (7) calendar days of that the Contractor knew or should have known of a site condition described below or the Contractor shall be deemed to waive any right to file any PCO or Claim for additional monies or time related to such condition:

(a) If the Contractor encounters unknown and reasonably unforeseeable subsurface or otherwise concealed physical conditions, including hazardous or historical/cultural materials under Article 6, which differ materially from those indicated by the Contract Documents or a site inspection; or

(b) If the Contractor encounters unknown physical conditions of an unusual nature which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents.

(2) **INCREASE IN CONTRACT TIME.** If the Contractor encounters a situation in which the Contractor knows or should have known that such situation would cause a delay, disruption, interruption, suspension or the like to the Project, the Contractor must file a

notice with the Intermountain Representative within seven (7) working days of when the Contractor knew or should have known of such circumstance or the Contractor shall be deemed to waive any right to file any PCO or Claim for additional monies or time related to such circumstance. To the extent Intermountain is damaged by the failure of the Contractor to provide such notice after the Contractor knows or should have known of such circumstance, the Contractor shall be liable for damages attributable thereto in addition to any liquidated damages (if applicable).

7.2 CONTRACTOR INITIATED REQUESTS

7.2.1 THE REQUEST FOR INFORMATION, RFI, PROCESS AND TIME TO FILE. The Contractor may file an RFI with the A/E regarding any concern which will assist the Contractor in the proper completion of the Work including, but not limited to issues related to the Contract Documents, plans and specifications. The RFI shall be filed with the A/E in a timely manner so as not to prejudice Intermountain as to the quality, time or money related to the Work.

7.2.2 PROPOSED CHANGE ORDER (□PCO□). Within twenty-one (21) days after the Contractor knows or should have known of a situation or concern where the Contractor is going to request additional monies or time, the Contractor must file a Proposed Change Order (□PCO□) with Intermountain Representative, or the Contractor shall be deemed to waive any right to claim additional monies or time related to such situation or concern. The PCO shall include all available documentation supporting the PCO available to the Contractor at the time of filing and the Contractor shall thereafter diligently pursue the supplementation(s) of such documentation and promptly deliver such supplementation(s) to Intermountain Representative.

(1) **INTERMOUNTAIN REPRESENTATIVE RESPONSE.** One of the following may occur after a PCO is filed with Intermountain Representative:

(a) Intermountain Representative, after considering any input by the A/E, may reach an agreement with the Contractor and issue a Change Order.

(b) Intermountain, after considering any input by the A/E, may issue a Construction Change Directive.

(c) If Intermountain Representative, after considering any input by the A/E, disagrees with the Contractor's PCO, Intermountain representative may seek additional information or verification from the Contractor, the A/E or other sources, may negotiate with the Contractor, may issue a Change Order upon such later agreement, may retract the PR, or may issue a Construction Change Directive. The A/E must continually work with Intermountain in providing data, documentation and efforts to resolve the issues related to the PR.

7.3 PROPOSAL REQUEST INITIATED BY INTERMOUNTAIN. Intermountain may file a Proposal Request with the Contractor seeking information, data and/or pricing relating to a change in the contract time and or monies owing for particular scope changes or other modifications to the Contract Documents. The PR shall provide a time limit for the Contractor to file a response with the A/E and Intermountain Representative. If a proposal is not timely provided by the Contractor, Intermountain may calculate the Change Order under Article 7.4.2 below. Upon such timely receipt of the proposal, one of the following shall occur:

7.3.1 IF AGREEMENT, CHANGE ORDER ISSUED. Intermountain Representative, after considering any input by the A/E, may reach an agreement with the Contractor and issue a Change Order.

7.3.2 IF DISAGREEMENT. If the Intermountain Representative disagrees with the Contractor's proposal, after considering any input from the A/E, Intermountain representative may seek additional information or verification from the Contractor or other sources, may negotiate with the Contractor, may issue a Change Order upon such later agreement, may retract the PR, or may issue a Construction Change Directive. If a Construction Change Directive is issued which identifies Intermountain representative's position in regard to the subject contract sum and/or time adjustment, the Contractor must initiate the Claim resolution process provided for herein within twenty-one (21) days of the Contractor's receipt of the Construction Change Directive, or the Contractor shall be deemed to waive any such request for additional time or money as a result of the issuance of the Construction Change Directive. Such waiver shall entitle Intermountain to convert the Construction Change Directive into a Change Order, whether or not executed by the Contractor. If the Construction Change Directive leaves open the determination of additional time or money related to the directed change, then the time period for initiating the Claim resolution process shall not accrue until such time as Intermountain has conveyed to the Contractor a position as to the time and money owing as a result of the directed change.

7.4 EVALUATION OF PROPOSAL FOR ISSUING CHANGE ORDERS

7.4.1 ADJUSTING SUM BASED UPON AGREEMENT. If the Change Order provides for an adjustment to the Contract Sum, the adjustment shall be based on the mutual agreement of the Contractor and Intermountain, including any terms mandated by unit price agreements or other terms of the Contract Documents.

7.4.2 INTERMOUNTAIN RESOLUTION OF SUM AND STANDARDS IN THE ABSENCE OF AN AGREEMENT UNDER PARAGRAPH 7.4.1. In the absence of an agreement under Paragraph 7.4.1 above, the adjustment shall be based on an itemized accounting of costs and savings supported by appropriate data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Paragraph shall be limited to the following:

(1) All direct and indirect costs of labor; including workers compensation insurance, social security and other federal and state payroll based taxes, and payroll based fringe benefits paid by Contractor so long as they are reasonable and no higher than that charged to other clients;

(2) Costs of materials, on-site temporary facilities, supplies and equipment (except hand tools) required for or incorporated into the work;

(3) Rental costs of machinery, equipment, tools (except hand tools), and on-site temporary facilities, whether rented from the Contractor or others;

(4) Costs of permits and other fees, sales, use or similar taxes related to the Work;

(5) Additional costs of field supervision and field office personnel directly attributable to the change; and

(6) Overhead and profit by the following liquidated formula which is not a penalty but a reasonable calculation agreed upon at the time of execution of the Contractor's Agreement, and provided by formula herein due to the fact that the actual amount due for said overhead and profit cannot easily be ascertained at the time of such execution. The markups in 7.4.2(6)(a) and (b) below are to cover the Contractor's additional payment and performance bond premiums, insurance premiums not specified under Paragraph 7.4.2(1), home office and on-site overhead and profit. Overhead and profit includes, but is not limited to the Contractor's Project Manager and Cost Estimator. Each request for pricing shall stand on its own and not be combined with other requests for pricing in determining the allowed markup described below. A particular request for pricing shall include all items reasonably related together and determinable at the time of the request. If several unrelated requests for pricing are grouped together in a single Change Order, each request for pricing will be considered separately for purposes of calculating the markup under the following formula:

(a) A markup of 15% shall be applied to the cost of each individual charge up to \$20,000 in cost, but in no case shall the markup be less than \$150;

(b) A markup of 10% shall be applied to the portion of the cost of each individual charge in excess of \$20,000;

(c) Subcontractors at any tier shall be entitled to markup their costs related to a Change Order with the same percentages as specified in Paragraphs 7.4.2(6)(a) and (b) above, except that the minimum markup shall be \$50 for any individual change.

7.4.3 CREDITS. The amount of credit to be allowed by the Contractor to Intermountain for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed to Intermountain based upon corroboration by an appropriate source.

7.5 CONSTRUCTION CHANGE DIRECTIVES

7.5.1 WHEN USED AND CONTRACTOR'S RIGHT TO CHALLENGE. A Construction Change Directive may be issued by Intermountain Representative in the case of a need for the Work to commence. If the Construction Change Directive leaves open the determination of additional time or money related to the directed change, then the Construction Change Directive shall indicate the timeframe(s) in which further information is to be provided to resolve the matter. At any time that Intermountain and the Contractor agree upon the time and money related to a Construction Change Directive, a Change Order shall be executed by the parties. Additionally, the Construction Change Directive may be converted to a Change Order under Paragraph 7.2.2 or Article 7.3 above.

7.5.2 PROCEED WITH WORK AND NOTIFY INTERMOUNTAIN ABOUT ADJUSTMENT METHOD. Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved.

7.5.3 INTERIM PAYMENTS BY INTERMOUNTAIN. Pending the final determination of the total cost of the Construction Change Directive, Intermountain shall pay any undisputed amount to the Contractor.

7.6 A/E'S SUPPLEMENTAL INSTRUCTION (Commonly referred to as an "ASI"). The A/E may at any time that is consistent with maintaining the quality, safety, time, budget and function of the Work, issue to the Contractor a supplemental instruction ("ASI") after approval from Intermountain Representative is obtained. The Contractor must file with Intermountain Representative a PCO under Paragraph 7.2.2 above, within 21 calendar days of the Contractor's receipt of the ASI, or the Contractor shall be deemed to have waived any right to additional time or monies as a result of such ASI.

7.8. RESOLUTION OF CLAIMS.

7.8.1 ESCALATION PROCESS. Each Claim must be submitted to the escalation process and then, if necessary, to judicial action, as described in the following:

(1) The parties involved in the Claim will arrange in-person meetings or telephone conferences at mutually convenient times and places, according to the levels and time schedules set forth below. The parties will use reasonable and good faith efforts in this escalation process to respond promptly and to resolve the Claim.

Levels and Representatives	Allotted Time Period from Notice or from Previous Level
<u>Level 1</u> Contractor: Managing Principal Intermountain: the Director	7 days
<u>Level 2</u> Associate Vice President or higher level executive	10 days

7.8.2 JUDICIAL ACTION. If any Claim cannot be resolved through the escalation process described above, the matter will be resolved through judicial action brought exclusively in the state courts of the State of Utah or in the federal courts of the United States which are located in Salt Lake County, Utah. The parties hereto hereby agree to submit to the jurisdiction and venue of such courts for the purposes hereof.

7.8.3 CONTRACTOR REQUIRED TO CONTINUE PERFORMANCE. Pending the final determination of the Claim, including any judicial review or appeal process, and unless otherwise agreed upon in writing by the Director, the Contractor shall proceed diligently with performance of the Contract and Intermountain shall continue to make payments in accordance with the Contract Documents.

7.9 PAYMENT OF CLAIM

7.9.1 When a standalone component of a Claim has received a final determination, and is no longer subject to review or appeal, that amount shall be paid in accordance with the payment provisions of the Contract Documents or judicial order.

7.9.2 When the entire Claim has received a final determination, and is no longer subject to review or appeal, the full amount shall be paid within fourteen (14) days of the date of the final determination unless the work or services has not been completed, in which case the amount shall be paid in accordance with the payment provisions of the Contract Documents to the point that the work or services is completed.

7.9.3 The final determination date is the earlier of the date upon which the claimant accepted the settlement in writing with an executed customary release document and waived its rights of appeal, or the expiration of the appeal period, with no appeal filed, or the determination made resulting from the final appeal.

7.9.4 Any final determination where the Intermountain is to pay additional monies to the Contractor shall not be delayed by any appeal or request for judicial review by another party brought into the process by Intermountain as being liable to Intermountain.

7.9.5 Notwithstanding any other provision of the Contract Documents, payment of all or part of a Claim is subject to any set-off, claims or counterclaims of Intermountain.

7.9.6 Payment to the Contractor for a Subcontractor issue (Claim) deemed filed by the Contractor, shall be paid by the Contractor to the Subcontractor in accordance with the contract between the Contractor and the Subcontractor.

7.9.7 The execution of a customary release document related to any payment may be required as a condition of making the payment.

7.10 ALLOCATION OF COSTS OF CLAIM RESOLUTION PROCESS

7.10.1 Except for attorneys' fees, and unless otherwise agreed to by the parties to the Claim, the costs of resolving the Claim shall be allocated among the parties on the same proportionate basis as the determination of financial responsibility for the Claim. The costs of resolving the Claim that are subject to allocation include the claimant's filing fee, the costs of any person(s) evaluating the Claim, the costs of making any required record of the process, and any additional testing or inspection procured to investigate and/or evaluate the Claim.

7.10.2 The prevailing Party in any Claim, judicial action or other proceeding is entitled to recover its reasonable attorneys' fees, other fees, and costs incurred in the proceeding, in addition to any other relief to which that Party may be entitled.

7.11 ALTERNATIVE PROCEDURES. To the extent otherwise permitted by law, if all parties to a Claim agree in writing, a protocol for resolving a Claim may be used that differs from the process described in this Article 7.

ARTICLE 8 PAYMENTS AND COMPLETION

8.1 SCHEDULE OF VALUES. With the first Application for Payment, the Contractor shall submit to the A/E and Intermountain Representative a schedule of values allocated to all the various portions of the Work. The Schedule of Values shall be submitted on the form approved and provided by Intermountain. The A/E shall make recommendations to the Intermountain Representative regarding the Schedule of Values including any suggested modifications. When approved, including any approved modifications, by Intermountain Representative, it shall be the basis for future Contractor Applications for Payments. The Contractor shall not be entitled to payment until receipt and acceptance of the Schedule of Values.

8.2 APPLICATIONS FOR PAYMENT

8.2.1 IN GENERAL. The following general requirements shall be met:

(1) The Contractor shall submit to the A/E an itemized Application for Payment for Work completed in accordance with the schedule of values and that reflects retainage as provided for in the Contractor's Agreement. The Application for Payment shall be on a special form approved and provided by Intermountain.

(2) Such application shall be supported by such data substantiating the Contractor's right to payment as Intermountain or A/E may require. Said data may include, but is not limited to, copies of requisitions from Subcontractors.

(3) Such applications may include requests for payment pursuant to approved Change Orders or Construction Change Directives.

(4) Such applications may not include requests for payment for portions of the Work performed by a subcontractor when the Contractor does not intend to pay to a Subcontractor because of a dispute or other reason.

(5) In executing the Application for Payment, the Contractor shall attest that subcontractors involved with prior applications for payment have been paid, unless the Contractor provides a detailed explanation why such payment may not have occurred. Intermountain reserves the right to require the Contractor to submit a payment waiver from one or more subcontractors.

8.2.2 PAYMENT FOR MATERIAL AND EQUIPMENT. Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by Intermountain and A/E, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to Intermountain to establish Intermountain's title to such materials and equipment or otherwise protect Intermountain's interest, and shall include applicable insurance, storage and transportation to the site for such materials and equipment stored off the site. Intermountain may require copies of invoices or other suitable documentation.

8.2.3 WARRANTY OF TITLE. The Contractor warrants that title to all Work covered by an Application for Payment will pass to Intermountain no later than the time for payment. The Contractor further warrants that upon submittal of an Application for Payment, all

Work for which Certificates for Payment have been previously issued and payments received from Intermountain shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, or other persons or entities making a claim by reason of having provided labor, materials and/or equipment relating to the Work.

8.2.4 HOLDBACK BY INTERMOUNTAIN. Notwithstanding anything to the contrary contained in the Contract Documents, Intermountain may, as a result of the Claim resolution process, withhold any payment to the Contractor hereunder if and for so long as the Contractor fails to perform any of its obligations hereunder or otherwise is in default under any of the Contract Documents.

8.3 CERTIFICATES FOR PAYMENT

8.3.1 ISSUED BY A/E. The A/E shall within ten (10) days after receipt of the Contractor's Application for Payment, either issue to Intermountain a Certificate for Payment, with a copy to the Contractor, for such amount as the A/E determines due, or notify the Contractor and Intermountain in writing of the A/E's reasons for withholding certification in whole or in part as provided in Paragraph 8.4.1. If the A/E fails to act within said ten (10) day period, the Contractor may file the Application for Payment directly with Intermountain Representative and Intermountain will thereafter have twenty (20) days from the date of Intermountain's receipt to resolve the amount to be paid and to pay the undisputed amount. The accuracy of the Contractor's Applications for Payment shall be Contractor's responsibility, not A/E's.

8.3.2 A/E'S REPRESENTATIONS. The A/E's issuance of a Certificate for Payment shall constitute a representation to Intermountain that to the best of the A/E's knowledge, information and belief, based upon the A/E's observations at the site, the data comprising the Application for Payment, and what is reasonably inferable from the observations and data, that the Work has progressed to the point indicated in the Application and that the quality of the work is in accordance with the Contract Documents. The foregoing representations are subject to minor deviations from the Contract Documents correctable prior to completion and to specific qualifications expressed by the A/E. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment shall not be a representation that the A/E has (a) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (b) reviewed construction means, methods, techniques, sequences or procedures, (c) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by Intermountain to substantiate the Contractor's right to payment, (d) ascertained how or for what purpose the Contractor used money previously paid on account of Contract Sum, or (e) any duty to make such inquiries.

8.4 DECISIONS TO WITHHOLD CERTIFICATION

8.4.1 WHEN WITHHELD. The A/E may decide not to certify payment and may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect Intermountain, if in the A/E's judgment the representations to Intermountain required in Paragraph 8.3.2 above cannot be made. If the A/E is unable to certify payment in the amount of the Application, the A/E shall notify the Contractor and Intermountain as provided in Paragraph

above. If the Contractor and A/E cannot agree on a revised amount, the A/E shall promptly issue a Certificate for Payment for the amount to which the A/E makes such representations to Intermountain. The A/E may also decide not to certify payment or, because of subsequently discovered evidence or observations, may nullify the whole or part of a Certificate for Payment previously issued, to such extent as may be necessary in the A/E's opinion to protect Intermountain from loss because of:

- (1) Defective Work not remedied;
- (2) Third party claims filed or reasonable evidence indicating probable filing of such claims;
- (3) Failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- (4) Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- (5) Damage to Intermountain or another contractor;
- (6) Reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- (7) Failure to carry out the Work in accordance with the Contract Documents.

8.4.2 CERTIFICATION ISSUED WHEN REASONS FOR WITHHOLDING REMOVED. When the reasons stated in Paragraph 8.4.1 for withholding certification are removed, certification will be made for such related amounts.

8.4.3 CONTINUE WORK EVEN IF CONTRACTOR DISPUTES A/E'S DETERMINATION. If the Contractor disputes any determination by the A/E or the result of the Claim resolution process with regard to any Certification of Payment, the Contractor nevertheless shall expeditiously continue to prosecute the Work.

8.4.4 INTERMOUNTAIN NOT IN BREACH. Intermountain shall not be deemed to be in breach of this Contract by reason of the withholding of any payment pursuant to any provision of the Contract Documents provided Intermountain's action or such withholding is consistent with the results of the dispute resolution process.

8.5 PROGRESS PAYMENTS

8.5.1 IN GENERAL, INTEREST ON LATE PAYMENTS

(1) Except as provided in Paragraph 8.3.1, Intermountain shall pay any undisputed amount within sixty (60) days of the date that the application for payment was submitted to the A/E. In no event shall Intermountain be required to pay any disputed amount.

(2) Except as otherwise provided by law, if any payment is made more than sixty (60) days after receipt by Intermountain of the applicable invoice (with any required supporting documentation), the late payment shall bear interest from the due date until payment is made at the rate of five percent (5%) per annum.

8.5.2 CONTRACTOR AND SUBCONTRACTOR RESPONSIBILITY. The Contractor shall promptly pay each Subcontractor, upon receipt of payment from Intermountain, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payment to its Subcontractors in a similar manner.

8.5.3 INFORMATION FURNISHED BY A/E OR INTERMOUNTAIN TO SUBCONTRACTOR. The A/E or Intermountain shall, on request, furnish to the Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the A/E and Intermountain on account of portions of the Work done by such Subcontractor.

8.5.4 INTERMOUNTAIN AND A/E NOT LIABLE. Neither Intermountain nor A/E shall have an obligation to pay, monitor or enforce the payment of money to a Subcontractor, except to the extent as may otherwise be required by law.

8.5.5 CERTIFICATE, PAYMENT OR USE NOT ACCEPTANCE OF IMPROPER WORK. A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by Intermountain shall not constitute acceptance of Work that is not in accordance with the Contract Documents.

8.6 PAYMENT UPON SUBSTANTIAL COMPLETION. Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and certification by the A/E, Intermountain shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof as provided in the Contract Documents. To the extent allowed by law, Intermountain may retain up to 200% of the fair market value of the work that has not been completed in accordance with the Contract Documents.

8.7 PARTIAL OCCUPANCY OR USE

8.7.1 IN GENERAL. Intermountain may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, and authorized by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is Substantially Complete, provided Intermountain and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of the warranties required by the Contract Documents. When the Contractor considers a portion to be substantially complete, the Contractor shall prepare and submit a list to the A/E as previously provided for herein. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. Contractor shall have continuing responsibility to protect the unoccupied portions of the site and the Work during such partial occupancy and shall be responsible for damage except to the extent caused solely by Intermountain during such partial occupancy or use.

The stage of progress of the Work shall be determined by written agreement between Intermountain and Contractor.

8.7.2 INSPECTION. Immediately prior to such partial occupancy or use, Intermountain, Contractor and A/E shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

8.7.3 NOT CONSTITUTE ACCEPTANCE. Except to the extent it is agreed upon in writing by Intermountain, partial occupancy or use of a portion or portion of the Work shall not constitute acceptance of Work not complying with the requirement of the Contract Documents.

8.8 FINAL PAYMENT

8.8.1 CERTIFICATE FOR PAYMENT. The A/E's final Certificate for Payment shall constitute a further representation that the conditions listed in Paragraph 8.8.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

8.8.2 CONDITIONS FOR FINAL PAYMENT. Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the A/E the following to the extent required by Intermountain Representative:

(1) An affidavit that payrolls, bills for material and equipment, and other indebtedness connected with the Work for which Intermountain's property might be responsible or encumbered (less amounts withheld by Intermountain) have been paid or otherwise satisfied;

(2) A current or additional certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days prior written notice, by certified mail, return receipt requested, has been given to Intermountain;

(3) A written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents;

(4) If requested by surety in a timely manner or by Intermountain, consent of surety, to final payment;

(5) Receipt of Record Drawings, Specifications, Addenda, Change Orders and other Modifications maintained at the site; the warranties, instructions, operation and maintenance manuals, and training videos required to be furnished by the Contract Documents;

(6) Other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by Intermountain. If a Subcontractor refuses to furnish a release or waiver required by Intermountain, Intermountain may require consent of Surety to the final payment. If such liens, claims, security interests or encumbrances remain unsatisfied after payments are made, the Contractor shall refund to Intermountain all money that Intermountain may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees; and

(7) A written statement demonstrating how the Contractor will distribute interest earned on retention to Subcontractors as required by Section 13.8.5, U.C.A.

8.8.3 WAIVER OF CLAIMS: FINAL PAYMENT. The making of final payment shall constitute a waiver of Claims by Intermountain except those arising from:

- (1) Liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- (2) Failure of the Work to comply with the requirements of the Contract Documents;
- (3) Terms of warranties required by the Contract Documents; or
- (4) The one-year guaranty period and any corrected Work.

8.8.4 DELAYS NOT CONTRACTOR'S FAULT. If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, Intermountain shall, upon application by the Contractor and certification by the A/E, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims. Unless otherwise stated by Intermountain in writing, the making of final payment shall constitute a waiver of claims by Intermountain as provided in Paragraph 8.8.3 for that portion of that Work fully completed and accepted by Intermountain.

8.8.5 WAIVER BY ACCEPTING FINAL PAYMENT. Acceptance of final payment by the Contractor or a Subcontractor shall constitute a waiver of Claims by that payee except those Claims previously made in writing and identified by that payee as unsettled at the time of final Application for Payment. Such waivers shall be in addition to the waiver described in Paragraph 8.8.3.

ARTICLE 9 TESTS AND INSPECTIONS, SUBSTANTIAL AND FINAL COMPLETION, UNCOVERING, CORRECTION OF WORK, AND GUARANTY PERIOD

9.1 TESTS AND INSPECTIONS

9.1.1 IN GENERAL. Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations, resolutions or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise specifically set forth in the Contract Documents or agreed to by Intermountain in writing, Intermountain shall contract for such tests, inspections and approvals with an independent entity, or with the appropriate public authority, and Intermountain shall bear all related costs of tests, inspections and approvals except as provided below. If any of the Work is required to be inspected or approved by the terms of the Contract Documents or by any public authority, the Contractor shall, at least two working days prior to the time of the desired inspection, and following the procedures established by Intermountain, request such inspection or approval to be performed. The Contractor shall give the A/E timely notice of when and where tests and inspections are to be made so that the A/E may observe such procedures.

9.1.2 FAILURE OF AN INSPECTOR TO APPEAR. Work shall not proceed without any required inspection and the associated authorization by Intermountain to proceed unless the following procedures and requirements have been met:

(1) The inspection or approval was requested in a timely manner as provided in Paragraph 9.1.1;

(2) The Contractor received written confirmation from the inspection entity that the inspection was scheduled;

(3) The Contractor has contacted or attempted to contact the inspector to confirm that the inspector is unable to perform the inspection as scheduled;

(4) If the inspector has confirmed that it is unable to perform the inspection as scheduled or if the Contractor is unable to contact the inspector, the contractor shall attempt to contact the Intermountain Representative for instruction; and the Contractor has documented the condition of the work prior to being covered through photos or other means.

9.1.3 NONCONFORMING WORK. If such procedures for testing, inspection or approval under Paragraph 9.1.1 reveal failure of portions of the Work to comply with the requirements established by the Contract Documents, the Contractor shall bear all costs made necessary by such failure including those of repeated procedures and compensation for Intermountain's expenses, including the cost of retesting for verification of compliance if necessary, until Intermountain accepts the Work in question as complying with the requirements of the Contract Documents.

9.1.4 CERTIFICATES. Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the A/E.

9.1.5 A/E OBSERVING. If the A/E is to observe tests, inspections or approvals required by the Contract Documents, the A/E shall do so with reasonable promptness and, where practicable, at the normal place of testing.

9.1.6 PROMPTNESS. Tests, inspections and arrangements for approvals conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

9.2 INSPECTIONS: SUBSTANTIAL AND FINAL

9.2.1 SUBSTANTIAL COMPLETION INSPECTION. Prior to requesting a substantial completion inspection, the Contractor shall prepare a comprehensive initial punchlist, including unresolved items from prior inspections, for review by Intermountain and A/E to determine if the Project is ready for a substantial completion inspection. If Intermountain determines that the initial punchlist indicates that the Project is not substantially complete, the initial punchlist will be returned to the Contractor with written comments. If Intermountain determines that the initial punchlist indicates that the Project may be substantially complete, the A/E shall promptly organize and perform a Substantial Completion inspection in the presence of Intermountain and all appropriate authorities.

(1) If the A/E reasonably determines that the initial punchlist prepared by the Contractor substantially understates the amount of the Work remaining to be completed and the Project is not substantially complete, the A/E shall report this promptly to Intermountain, and upon concurrence of Intermountain, the Contractor will be assessed the costs of the inspection and punchlist preparation incurred by the A/E and Intermountain.

(2) When the Work or designated portion thereof is Substantially Complete, the A/E shall prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion; shall establish responsibilities of Intermountain and Contractor for security, maintenance, heat, utilities, damage to the work and insurance; and shall fix the time within which the Contractor shall finish all items on the punchlist accompanying the Certificate. The Certificate of Substantial Completion shall require approval by Intermountain Representative. If there is a punchlist, the Contractor shall proceed promptly to complete and correct items on the list. Failure to include an item on the punchlist does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

(3) Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof except to the extent as provided otherwise in the Contract Documents or if such warranty is related to an item where the work is not complete. Such warranty documents shall state the length of the warranty, which must comply with the Contract Documents.

(4) The Certificate of Substantial Completion shall be submitted by the A/E to Intermountain and Contractor for their written acceptance of responsibilities assigned to them in such Certificate.

(5) Except to the extent Intermountain Representative otherwise approves in advance and in writing, the Contractor shall submit the following documents in order to achieve Substantial Completion: written warranties, guarantees, operation and maintenance manuals, and all complete as-built drawings. The Contractor must also provide or obtain any required approvals for occupancy. The Contractor is responsible for the guaranty of all Work, whether performed by it or by its Subcontractors at any tier.

9.2.2 FINAL COMPLETION INSPECTION. Prior to requesting a final inspection, the Contractor shall verify all punchlist items are corrected/completed. Once all punchlist items are corrected/completed the Contractor shall notify Intermountain and request a final inspection. Intermountain shall notify the A/E and perform a final inspection. Two final inspections may be allowed due to required weather changes required to complete some items. When all punchlist items are completed a final pay request will be provided by the Contractor, authorized by the A/E and processed by Intermountain.

9.3 UNCOVERING OF WORK

9.3.1 UNCOVER UNINSPECTED WORK. Except as provided in Paragraph 9.3.3, if a portion of the Work is covered prior to an Inspector's approval to proceed, it must, be uncovered for the Inspector's inspection and be replaced at the Contractor's expense without change in the Contract Time.

9.3.2 OBSERVATION PRIOR TO COVERING. Except as provided in Paragraph 9.3.3, if Intermountain or the A/E has requested in writing to observe conditions prior to any Work being covered or if such observation is specified in the Contract Documents, and the Work is covered without such observation, the Contractor shall be required to uncover and appropriately replace the Work at the Contractor's expense without change in the Contract Time. If the Contractor requests an inspection and Intermountain or A/E, including any inspector of

each, does not appear, the Contractor shall immediately notify Intermountain of such lack of appearance, but shall not cover the Work without such inspection.

9.3.3 WHEN AN INSPECTOR FAILS TO APPEAR OR A/E OR INTERMOUNTAIN DID NOT MAKE PRIOR REQUEST. If Work is performed by the Contractor without an inspection as provided in Paragraph 9.1.2 or if a portion of the Work has been covered which the A/E or Intermountain has not specifically requested to observe prior to its being covered or such observation is not specified by the Contract Documents, the A/E or Intermountain may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement, shall, by appropriate Change Order, be charged to Intermountain. If such Work is not in accordance with the Contract Documents, the Contractor shall pay such costs unless the condition was caused by Intermountain or a separate contractor in which event Intermountain shall be responsible for payment of such costs.

9.4 CORRECTION OF WORK AND GUARANTY PERIOD

9.4.1 CONTRACTOR CORRECT THE WORK. The Contractor shall correct Work rejected by the A/E, Inspector or Intermountain, or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear the costs of correcting such rejected Work, including additional testing and inspections and compensation for the A/E's and Inspector's services and expenses made necessary thereby.

9.4.2 GUARANTY AND CORRECTION AFTER SUBSTANTIAL COMPLETION. If within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Paragraph 9.2.1 or by terms of an applicable special warranty or guaranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, including failure to perform for its intended purpose, the Contractor shall correct it promptly after receipt of written notice from Intermountain to do so unless Intermountain has previously given the Contractor a written acceptance of such condition. The period of one year shall be extended with respect to portions of the Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work. This obligation of the Contractor under this Paragraph 9.4.2 shall be operative notwithstanding the acceptance of the Work under the Contract, the final certificate of payment, partial or total occupancy and/or termination of the Contract. Intermountain shall give notice of observed defects with reasonable promptness, however, failure to give such notice shall not relieve the Contractor of its obligation to correct the Work at the cost that the Contractor would have incurred if Intermountain did so report with reasonable promptness. All corrected Work shall be subject to a one-year guaranty period the same in all respects as the original Work, except that such guaranty period shall commence from the time of Substantial Completion of the corrected Work. This guaranty period does not affect Intermountain's right to pursue any available remedies against Contractor.

9.4.3 REMOVAL OF WORK

(1) The Contractor shall promptly remove from the premises all Work that Intermountain and/or the A/E determines as being in nonconformance with the Contract Documents, whether incorporated or not.

(2) The Contractor shall promptly replace and re-execute the Work in accordance with the Contract Documents and without expense to Intermountain.

(3) The Contractor shall bear the expense of correcting destroyed or damaged construction, whether completed or partially completed, of Intermountain or of other contractors destroyed or damaged by such removal or replacement.

(4) If the Contractor does not remove such rejected Work within a reasonable time, fixed by written notice, Intermountain may have the materials removed and stored at the expense of the Contractor.

(5) If the Contractor does not correct the nonconforming Work within a reasonable time, fixed by written notice, Intermountain may correct it in accordance with Paragraph 12.2.2 of these General Conditions.

9.4.4 NOT LIMIT OTHER OBLIGATIONS. Nothing contained in this Article 9.4 shall be construed to establish a period of limitation with respect to other obligations which the Contractor may have under the Contract Documents. Establishment of the time period of one year as described in Paragraph 9.4.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

9.5 ADDITIONAL WARRANTIES

9.5.1 IN GENERAL. In addition to any other provisions of this Article 9, the following warranties shall apply:

(1) The Contractor warrants to Intermountain that materials and equipment furnished under the Contract will be of good quality and new, except to the extent otherwise required or expressly permitted by the Contract Documents.

(2) The Contractor also warrants to Intermountain that the Work will be free from defects not inherent in the quality required or permitted and that the Work will conform to the requirements of the Contract Documents. Work not conforming to said requirements, including substitutions not properly approved and authorized, may be considered defective at Intermountain's option.

9.5.2 EXCLUSION. Unless due to the negligent or intentional act or omission of the Contractor or those under the Contractor's control, or as otherwise stated in the Contract Documents, the Contractor's guaranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage.

9.5.3 FURNISH EVIDENCE ON REQUEST. If requested by the A/E or Intermountain, the Contractor shall furnish satisfactory evidence as to the type and quality of materials and equipment.

9.6 ACCEPTANCE OF NONCONFORMING WORK. If Intermountain prefers to accept Work which is not in accordance with the requirements of the Contract Documents, Intermountain may do so in writing instead of requiring its removal and correction, in which case the Contract Sum shall be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 10 INSURANCE AND BONDS

10.1 LIABILITY INSURANCE. To protect against liability, loss and/or expense arising in connection with the performance of services described under the Contract Documents, the Contractor shall obtain and maintain in force during the entire period of Contract Documents without interruption, as part of the Construction Costs for the Project, the following stated insurance from insurance companies authorized to do business in the State of Utah, in a form and content satisfactory to Intermountain. The Contractor shall require all Subcontractors to have and maintain similarly required policies. All of the following listed insurance coverages shall be provided by the Contractor.

10.1.1 CONTRACTOR'S COMMERCIAL GENERAL LIABILITY INSURANCE. The Contractor shall maintain coverage on an occurrence made basis, annual aggregate policy limit based on the following chart, unless modified by mutual agreement of the parties, including coverage for Premises-Operations, Independent Contractors' Protective, Products-Completed Operations, Contractual Liability, Personal Injury, and Broad-Formed Property Damage (including coverage for Explosion, Collapse, and Underground hazards).

Small Project (\$2,000,000 or less)
Minimum Commercial General Liability Coverage
\$1,000,000 each occurrence,
\$3,000,000 general aggregate
Medium Project (\$2,000,001 to \$10,000,000)
Minimum Commercial General Liability Coverage
\$5,000,000 each occurrence,
\$10,000,000 general aggregate
Large Project (Greater than \$10,000,000)
Minimum Commercial General Liability Coverage
\$10,000,000 each occurrence,
\$20,000,000 general aggregate

For insurance purposes, the size of the Project will be specified in the Contractor's Agreement or CM/GC Agreement, as applicable.

Intermountain reserves the right to require additional coverage from that stated in the chart herein above, at Intermountain's expense for the additional coverage portion only. Intermountain also reserves the right to require project specific insurance, and if such right has been exercised it

shall be indicated in the Contract Documents. Unless project specific insurance is required by Intermountain, the coverage shall be written under a policy with limits applicable to this project only. Products and Completed Operations insurance must be maintained in force for the discovery of claims for the full statute of limitations period under applicable law. The Contractor's policy must also include contractual liability coverage applicable to the indemnity provision of this Agreement for those portions of the indemnity provisions that are insured under the Contractor's policy and in accordance with this Agreement, including the attachments hereto.

The Contractor shall collect and keep on-file evidence that Contractor and each Subcontractor has current certificates of this Commercial General Liability Insurance requirement, and produce them upon request by Owner.

10.1.2 WORKERS' COMPENSATION INSURANCE AND EMPLOYERS' LIABILITY INSURANCE. Worker's Compensation Insurance shall cover full liability under the Worker's Compensation Laws of the jurisdiction in which the Project is located at the statutory limits required by said jurisdiction's laws. The Contractor shall collect and keep on-file evidence that Contractor and each Subcontractor has current Workers Compensation Insurance, as required by State statute, and produce them upon request by Owner.

10.1.3 AUTOMOBILE. Automobile liability insurance for claims arising from the ownership, maintenance, or use of a motor vehicle. The insurance shall cover all owned, non-owned, and hired automobiles used in connection with the work, with the following minimum limits of liability: \$1,000,000 Combined Single Limit Bodily Injury and Property Damage per Occurrence.

10.1.4 VALUABLE PAPERS AND RECORDS COVERAGE AND ELECTRONIC DATA PROCESSING (DATA AND MEDIA) COVERAGE. The Contractor and all Subcontractors of the Contractor shall provide coverage for the physical loss of or destruction to their work product including drawings, specifications, and electronic data and media.

10.1.5 AIRCRAFT USE. Contractor using its own aircraft, or employing aircraft in connection with the work performed under the Contract Documents shall maintain Aircraft Liability Insurance with a combined single limit of not less than \$1,000,000 per occurrence. Said certificate shall state that the policy required by this paragraph has been endorsed to name Intermountain as an Additional Insured.

10.1.6 POLICY AGGREGATE(S). The Contractor's policy(ies) shall be endorsed to have General Aggregate apply to this Project only.

10.1.7 CERTIFICATES. Before the Contract Documents are executed, the Contractor shall submit certificates in form and substance satisfactory to Intermountain as evidence of the insurance requirements of this Article. Such certificates shall contain provisions that no cancellation, or non-renewal shall become effective except upon thirty (30) days prior written notice by US Mail to Intermountain as evidenced by return receipt, certified mail sent to Intermountain. The Contractor shall notify Intermountain within thirty (30) days of any claim(s) against the Contractor which singly or in the aggregate exceed 20% of the applicable required insured limits and the Contractor shall, if requested by Intermountain, use its best efforts to reinstate the policy within the original limits and at a reasonable cost. Intermountain shall be named as an additional insured party, as primary coverage and not contributing, on all the

insurance policies required by this Article except the professional liability and workers' compensation policies. Intermountain reserves the right to request the Contractor to provide a loss report from its insurance carrier.

10.1.8 MAINTAIN THROUGHOUT CONTRACT DOCUMENTS TERM. The Contractor agrees to maintain all insurance required under the Contract Documents during the required term. If the Contractor fails to furnish and maintain said required insurance, Intermountain may purchase such insurance on behalf of the Contractor, and the Contractor shall pay the cost thereof to Intermountain upon demand and shall furnish to Intermountain any information needed to obtain such insurance.

10.1.9 WAIVERS OF SUBROGATION. All policies required, except Workers Compensation Insurance, shall be endorsed to include waivers of subrogation in favor of Intermountain.

10.1.10 EXCESS COVERAGES. Any type of insurance or any increase of limits of liability not described in the Contract Documents which the Contractor requires for its own protection or on account of any statute, rule or regulation, shall be its own responsibility and at its own expense.

10.1.11 NOT RELIEVE CONTRACTOR OF LIABILITY. The carrying of any insurance required by the Contract Documents shall in no way be interpreted as relieving the Contractor of any other responsibility or liability under the Contract Documents or any applicable law, statute, rule, regulation, or order.

10.1.12 CONTRACTOR COMPLIANCE WITH POLICIES. Contractor shall not violate or knowingly permit to be violated any of the provisions of the policies on insurance required under this Agreement.

10.1.13 DEDUCTIBLE LIABILITY. Any and all deductibles in the above described policies shall be assumed by, for the account of, and at sole risk of Contractor. The allowable deductible for any of the policies required by these General Conditions shall be no more than \$1,000 or 0.1 percent of the Contract Amount, whichever is greater.

10.1.14 ADDITIONAL REQUIREMENTS

(1) Any type of insurance or any increase of limits of liability not described in this Agreement which the Contractor requires for its own protection or on account of any statute, rule or regulation, shall be its own responsibility and at its own expense.

(2) The carrying of any insurance required by this Agreement shall in no way be interpreted as relieving the Contractor or Subcontractors of any other responsibility or liability under this Agreement or any applicable law, statute, rule, regulation or order.

(3) Contractor shall not violate or knowingly permit to be violated any of the provisions of the policies on insurance required under these General Conditions.

10.2 BUILDER'S RISKPROPERTY INSURANCE

10.2.1 IN GENERAL. At Intermountain's option, Intermountain may provide, or may require Contractor to provide, Builder's Riskproperty insurance to protect Intermountain, as well as all Contractors and Subcontractors, and include them as insureds, with respect to Work

performed hereunder at Intermountain's own cost and expense, according to the policies and forms currently in force with insurance carriers selected by Intermountain.

10.2.2 DEDUCTIBLE. The above described Builders Riskpolicies shall be subject to a total deductible of \$5,000 per loss occurrence, which shall be assumed by all Contractors or Subcontractors, in proportion to their share of the total amount of an insured loss occurrence.

10.2.3 WAIVER. Contractor, including all Subcontractors, and Intermountain hereby waive all rights against each other for damages caused by perils insured against under the Builder's Riskinsurance provided by Intermountain and the Contractor each shall require similar waivers from their contractors, subcontractors, sub-consultants and agents, at any tier.

10.2.4 SPECIAL HAZARDS. Intermountain shall bear the risk of loss, delay and/or damage due to earthquake and/or flood and may either insure or self-insure that risk. If the Contractor requests in writing that insurance for other special hazards be included in the Builder's Riskpolicy, Intermountain shall, if possible, include such insurance in the policy and the cost thereof shall be charged to the Contractor by Change Order.

10.3 PERFORMANCE BOND AND PAYMENT BOND. If required by the Contract Documents, the Contractor shall submit and maintain in full force and effect as required by law and the Contract Documents, as part of the Construction Costs for the Project, on forms provided by Intermountain, and include as part of the quoted total all costs involved in securing and furnishing, the bonds listed below, based on the completed cost of the Contract and effective upon execution of the Contract. Said bonds shall be from surety companies which are authorized to do business in the State of Utah, listed in the U. S. Department of Treasury Circular 570, Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies, and acting within the limitation listed therein.

10.3.1 A full 100 percent performance bond covering the faithful execution of the Contract in accordance with the Contract Documents; and

10.3.2 A full 100 percent payment bond covering payment of all obligations arising under the Contract Documents, for the protection of each person supplying labor, service, equipment, or material for the performance of the Work.

10.3.3 Any required insurance required under the U.S. Terrorism Risk Insurance Act of 2002, any similar applicable law, or as such Act may be amended.

10.4 INTERMOUNTAIN SELF-INSURANCE. Intermountain may, at its option, satisfy any insurance requirements applicable to Intermountain through its self-insurance and risk management program.

ARTICLE 11 MISCELLANEOUS PROVISIONS

11.1 A/E'S RESPONSIBILITIES. These General Conditions are not intended to provide an exhaustive or complete list of the A/E's responsibilities. A separate agreement between Intermountain and A/E incorporates these General Conditions by reference and includes additional Design responsibilities.

11.2 SUCCESSORS AND ASSIGNS. Intermountain and Contractor respectively bind themselves, to the other party in respect to covenants, agreements and obligations contained in the Contract Documents. The Contractor shall not assign the Contract without the prior written consent of Intermountain, nor shall the Contractor assign any amount due or to become due as well as any rights under the Contract, without prior written consent of Intermountain.

11.3 WRITTEN NOTICE. Written notice shall be deemed to have been duly served if (a) delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended, or (b) delivered at or sent by registered or certified mail, return receipt requested, or (c) deposited for delivery with a nationally recognized overnight courier service, to the last business address known to the party giving notice.

11.4 RIGHTS AND REMEDIES

11.4.1 NOT LIMIT. Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

11.4.2 NOT WAIVER. Except as expressly provided elsewhere in the Contract Documents, no action or failure to act by Intermountain, A/E or Contractor shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall such action or failure to act constitute approval or acquiescence in a breach thereunder, except as any of the above may be specifically agreed to in writing. In no case shall the Contractor or any Subcontractors be entitled to rely upon any waiver of any of these General Conditions unless agreed to in writing by Intermountain.

11.5 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

11.5.1 BEFORE SUBSTANTIAL COMPLETION. Except as provided in 11.5.4 below, as to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion.

11.5.2 BETWEEN SUBSTANTIAL COMPLETION AND FINAL CERTIFICATION FOR PAYMENT. Except as provided in Paragraph 11.5.4 below, as to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certification for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certification for Payment.

11.5.3 AFTER FINAL CERTIFICATION FOR PAYMENT. Except as provided in Paragraph 11.5.4 below, as to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to any guaranty provided under Article 9 the date of any correction of the Work or failure to correct the Work by the Contractor under Paragraph 9.4.2, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Intermountain, whichever occurs last.

11.5.4 EXCEPTION. Notwithstanding any other provision of this Article 11.5 to the contrary, no applicable statute of limitations shall be deemed to have commenced with respect to any portion of the Work which is not in accordance with the requirements of the Contract Documents, which would not be visible or apparent upon conducting a reasonable investigation, and which is not discovered by Intermountain until after the date which, but for this Paragraph 11.5.4, would be the date of commencement of the applicable statute of limitations; the applicable statute of limitations instead shall be deemed to have commenced on the date of such discovery by Intermountain.

11.6 APPLICABLE LAWS. The applicable laws and regulations of the State of Utah, as well as any applicable local laws and regulations not superseded or exempted by State law, shall govern the execution of the Work embodied in the Contract Documents as well as the interpretation of the Contract Documents.

11.7 INTERPRETATION. In the interest of brevity, the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an", but the fact that a modification or an article is absent from the statement and appears in another is not intended to affect the interpretation of either statement.

11.8 VENUE. In case of any dispute, which may arise under the Contract Documents, the place of venue shall be in the County of Salt Lake, Utah, unless otherwise agreed to by all the parties in writing.

11.9 SEVERABILITY. The invalidity of any part, paragraph, subparagraph, phrase, provision or aspect of the Contract documents shall not impair or affect in any manner the validity, enforceability or effect of the remainder of the Contract Documents.

11.10 CONSTRUCTION OF WORDS. Unless otherwise stated in the Contract Documents, words, which have well-known technical or construction industry meanings, shall be construed as having such recognized meanings. Unless the context requires otherwise, all other technical words shall be construed in accordance with the meaning normally established by the particular, applicable profession or industry. All other words, unless the context requires otherwise, shall be construed with an ordinary, plain meaning.

11.11 NO THIRD PARTY RIGHTS. These General Conditions create rights and duties only as between Intermountain and Contractor, and Intermountain and A/E. Nothing contained herein shall be deemed as creating third party beneficiary contract rights or other actionable rights or duties as between Contractor and A/E, or as between Intermountain, Contractor, or A/E on the one hand, and any other person or entity.

ARTICLE 12 TERMINATION OR SUSPENSION OF THE CONTRACT

12.1 TERMINATION BY CONTRACTOR

12.1.1 IN GENERAL. If the Work is stopped for a period of ninety (90) days through no act or fault of the Contractor or a Subcontractor, or their agents or employees or any other persons performing portions of the Work under contract with any of the above, the Contractor, may terminate the Contract in accordance with 12.1.2 herein below for any of the following reasons:

(1) Because Intermountain has persistently failed to fulfill fundamental Intermountain's obligations under the Contract Documents with respect to matters important to the progress of the Work;

(2) Issuance of an order of a court or other public authority having jurisdiction which necessitates such termination, except that where the Contractor has standing, the Contractor must cooperate in efforts to stay and/or appeal such order;

(3) An act of government, such as a declaration of national emergency, making material unavailable; or

(4) Unavoidable casualties or other similar causes as listed in Paragraph 12.2.2(2) herein below.

12.1.2 NOTICE. If one of the reasons for termination in Paragraph 12.1.1 hereinabove exist, the Contractor may, upon ten (10) additional days' written notice to Intermountain and A/E, and such condition giving cause for termination still not cured, terminate the Contract and recover from Intermountain payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead, profit and damages associated only with work completed prior to the notice of termination.

12.2 TERMINATION BY INTERMOUNTAIN FOR CAUSE

12.2.1 IN GENERAL. Intermountain may terminate the Contract if the Contractor fails to cure any of the following within a period of ten (10) days (or longer if Intermountain so approves in writing) after receipt of notice from Intermountain specifying the cause for termination:

(1) The Contractor persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

(2) The Contractor fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

(3) The Contractor persistently disregards laws, ordinances, or rules, regulations, resolutions or orders of a public authority having jurisdiction; or

(4) The Contractor fails to perform the Work within the time specified in the Contract Documents or any authorized extension thereof or the Contractor fails to make progress with the Work as to endanger such compliance;

(5) The Contractor fails to perform the Work or is otherwise in breach of a material provision of the Contract Documents;

(6) The Contractor fails to respond promptly to the financial responsibility inquiry under the Contractor's Agreement;

(7) As permissible by law for a reason to terminate, the Contractor is adjudged bankrupt;

(8) As permissible by law for a reason to terminate, the Contractor should make a general assignment for the benefit to creditors;

(9) As permissible by law for a reason to terminate, the Contractor should have a receiver appointed on account of the Contractor's insolvency; or

(10) The Contractor fails to follow the material safety requirements and precautions either as expressly provided in the Contract Documents or as consistent with the customary practices in the industry.

12.2.2 INTERMOUNTAIN'S RIGHT TO CARRY OUT THE WORK

(1) If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten (10) day period (or longer if approved by Intermountain in writing) after receipt of written notice from Intermountain to cure such default or neglect, Intermountain may without prejudice to other remedies Intermountain may have, correct such deficiencies, including taking over the Work and prosecuting the same to completion, by contract or otherwise, and may take possession of, and utilize in completing the Work, such materials, appliances, and facilities as may be on the site of the Work as well as the site as necessary for its proper completion. In such case, Intermountain shall offset from payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the A/E, Intermountain's staff and legal counsel's additional services and expenses made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to Intermountain. The Contractor shall continue performance of the Contract to the extent not terminated.

(2) Except with respect to defaults of Subcontractors, the Contractor shall not be liable for any excess costs if the failure to perform the Contract arises out of causes beyond the control and without the fault or negligence of the Contractor or anyone for whom the Contractor may be liable. Such causes may include, but are not limited to, acts of God or of the public enemy, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather; but in every case the failure to perform must be beyond the control and without the fault or negligence of the Contractor or anyone for whom the Contractor may be liable. If the failure to perform is caused by the default of a Subcontractor, and if such default arises out of causes beyond the control of both the Contractor and the Subcontractor, and without the fault or negligence of either of them or anyone for whom either may be liable, the Contractor shall not be liable for any excess costs for failure to perform unless the supplies or services to be furnished by the Subcontractor were obtainable from other sources in sufficient time to permit the Contractor to meet the required delivery or completion schedule.

12.2.3 ITEMS REQUIRED TO BE TRANSFERRED OR DELIVERED.

Intermountain may require the Contractor to transfer title and deliver to Intermountain, in the manner and to the extent directed by Intermountain:

(1) Any completed portion of the Work; and

(2) Any partially completed portion of the Work and any parts, tools, dies, jigs, fixtures, drawings, information, and contract rights (hereinafter called "construction materials") as the Contractor has specifically produced or specifically acquired for the

performance of such part of this Contract as has been terminated; and the Contractor shall, upon direction of Intermountain, protect and preserve property in the possession of the Contractor in which Intermountain has an interest.

12.2.4 PAYMENT. When Intermountain terminates the Contract for one or more of the reasons stated in Paragraph 12.2.1, Intermountain may withhold payment and/or pursue all available remedies.

12.2.5 INTERMOUNTAIN PROTECTION IF LIENABLE. When the subject property is lienable, Intermountain may withhold from amounts otherwise due the Contractor for such completed Work or construction materials such sum as Intermountain determines to be necessary to protect Intermountain against loss because of outstanding liens or claims for former lien holders.

12.2.6 CREDITS AND DEFICITS. If the unpaid balance of the Contract Sum exceeds the full cost of finishing the Work, including compensation for the A/E's services and expenses made necessary thereby, such excess shall be paid to the Contractor. If such cost exceeds the unpaid balance, the Contractor shall pay the difference to Intermountain this obligation for payment shall survive the termination of the Contract.

12.2.7 IF CONTRACTOR FOUND NOT IN DEFAULT OR EXCUSABLE. If, after notice of termination of the Contract under the provisions of this Article, it is determined for any reason that the Contractor was not in default under the provisions of this Article, or that the default was excusable under the provisions of this Article, the rights and obligations of the parties shall be the same as if the notice of termination had been issued pursuant to the termination for convenience provisions.

12.2.8 RIGHTS AND REMEDIES NOT EXCLUSIVE. The rights and remedies of Intermountain provided in this Article 12.2 shall not be exclusive and are in addition to any other rights and remedies provided by law or under this Contract.

12.3 SUSPENSION, DELAY OR INTERRUPTION OF WORK BY INTERMOUNTAIN FOR CONVENIENCE

12.3.1 BY INTERMOUNTAIN IN WRITING. Intermountain may in writing and without cause, order the Contractor to suspend, delay or interrupt the Work in whole or in part for such period of time as Intermountain may determine to be appropriate for the convenience of Intermountain.

12.3.2 ADJUSTMENTS. Any adjustment in Contract Sum and Time shall be in accordance with Articles 3, 4, and 7.

12.4 TERMINATION FOR CONVENIENCE OF INTERMOUNTAIN

12.4.1 IN GENERAL. The performance of Work under this Contract may be terminated by Intermountain in accordance with this Article 12.4 in whole, or from time to time, in part, whenever Intermountain shall determine that such termination is in the best interest of Intermountain or any person for whom Intermountain is acting under this Contract. Any such termination shall be effected by delivery to the Contractor of a notice of termination specifying the extent to which performance of Work under the Contract is terminated, and the date upon which such termination becomes effective.

12.4.2 CONTRACTOR OBLIGATIONS. After receipt of a notice of termination, and except as otherwise directed by Intermountain in writing, the Contractor shall:

(1) Stop work under the Contract on the date and to the extent specified in the notice of termination;

(2) Place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portion of the Work under the Contract as is not terminated;

(3) Terminate all orders and subcontracts to the extent that they relate to performance of Work terminated by the notice of termination;

(4) Assign to Intermountain in the manner, at the times, and to the extent directed by Intermountain, all of the right, title and interest of the Contractor under the orders and subcontracts so terminated, in which case Intermountain shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;

(5) Settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, with the approval or ratification of Intermountain, which approval or ratification shall be final for all the purposes of this Article 12.4;

(6) Transfer title and deliver to Intermountain in the manner, at the times, and to the extent, if any, directed by Intermountain:

(a) The fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced as a part of, or acquired in connection with the performance of the Work terminated by the notice of termination; and

(b) The completed or partially completed drawings, information, and other property which, if the Contract had been completed, would have been required to be furnished to Intermountain;

(7) Use best efforts to sell, in the manner, at the times, to the extent, and at the price or prices directed or authorized by Intermountain, any property of the types referred to in Paragraph 12.4.2(6) above; provided, however, that the Contractor:

(a) Shall not be required to extend credit to any purchaser; and

(b) May acquire any such property under the conditions prescribed by and at a price or prices approved by Intermountain; and provided further that the proceeds of any such transfer of or disposition shall be applied in reduction of any payments to be made by Intermountain to the Contractor under this Contract or shall otherwise be credited to the price or cost of the Work covered by this Contract or paid in such other manner as Intermountain may direct;

(8) Complete performance of such part of the Work as shall not have been terminated by the notice of termination; and

(9) Take such action as may be necessary, or as Intermountain may direct, for the protection and preservation of the property related to this Contract which is in the possession of the Contractor in which Intermountain has or may acquire an interest.

12.4.3 AGREED UPON PAYMENT. Subject to the provisions of Paragraph 12.4.3 above, the Contractor and Intermountain may agree upon the amount to be paid to the Contractor by reason of the total or partial termination of Work pursuant to this Article 12.4.

12.4.4 PAYMENT NOT AGREED UPON. In the event of the failure of Contractor and Intermountain to agree, as provided in Paragraph 12.4.4, upon the whole amount to be paid to the Contractor by reason of the termination of Work pursuant to this Article 12.4, Intermountain shall pay to the Contractor the amounts determined by Intermountain as follows, but without duplication of any amounts agreed upon in accordance with Paragraph 12.4.3:

(1) With respect to all Contract Work performed prior to effective date of the notice of termination, the total (without duplication of any items) of:

(a) The cost of such Work including undisputed Claim amounts;

(b) The cost of terminating, settling and paying claims arising out of the termination of Work under subcontracts or orders as provided in Paragraph 12.4.2(5) above, exclusive of the amounts paid or payable on account of supplies or materials delivered or services furnished by Subcontractors prior to the effective date of the notice of termination under this Contract, which amounts shall be included in the cost on account of which payment is made under Paragraph 12.4.4(1)(a) above;

(c) A sum, as overhead and profit on Paragraph 12.4.4(1) (a) above, determined by Intermountain to be fair and reasonable;

(d) The reasonable cost of the preservation and protection of property incurred pursuant to Paragraph 12.4.2(9); and any other reasonable cost incidental to termination of Work under this Contract, including expenses incidental to the determination of the amount due to the Contractor as the result of the termination of Work under this Contract.

(2) The total sum to be paid to the Contractor under Paragraph 12.4.4(1) above shall not exceed the total Contract Sum as reduced by the amount of payments otherwise made and as further reduced by the Contract price of work not terminated. Except for normal spoilage, and except to the extent that Intermountain shall have otherwise expressly assumed the risk of loss in writing, there shall be excluded from the amounts payable to the Contractor under Paragraph 12.4.4(1) above, the fair value of property which is destroyed, lost, stolen, or damaged so as to become undeliverable to Intermountain, or to a buyer pursuant to Paragraph 12.4.2(7).

12.4.5 DEDUCTIONS. In arriving at the amount due the Contractor under this Article 12.4, there shall be deducted:

(1) All unliquidated advance or other payments on account theretofore made to the Contractor, applicable to the terminated portion of this Contract;

(2) Any Claim which Intermountain may have against the Contractor in connection with this Contract; and

(3) The agreed price for, or the proceeds of sale of, any materials, supplies, or other things acquired by the Contractor or sold, pursuant to the provisions of this Article 13.4, and not otherwise recovered by or credited to Intermountain.

12.4.6 PARTIAL PAYMENTS. Intermountain may, from time to time, under such terms and conditions as it may prescribe, make partial payments and payments on account against cost incurred by the Contractor in connection with the terminated portion of this Contract whenever, in the opinion of Intermountain the aggregate of such payments shall be within the amount to which the Contractor will be entitled hereunder. If the total of such payments is in excess of the amount finally agreed or determined to be due under this Article 12.4, such excess shall be payable by the Contractor to Intermountain upon demand, together with interest at a rate of five percent (5%) per annum for the period until the date such excess is repaid to Intermountain; provided, however, that no interest shall be charged with respect to any such excess payment attributable to a reduction in the Contractor's claim by reason of retention or other disposition of termination inventory until ten (10) days after the date of such retention or disposition, or such later date as determined by Intermountain by reason of the circumstances.

12.4.9 PRESERVE AND MAKE AVAILABLE RECORDS. Unless otherwise provided for in this Contract, or by applicable law, the Contractor shall, from the effective date of termination until the expiration of three years after final settlement under this Contract, preserve and make available to Intermountain at all reasonable times at the office of the Contractor, but without direct charge to Intermountain, all books, records, documents and other evidence bearing on the costs and expenses of the Contractor under this Contract and relating to the Work terminated hereunder, or, to the extent approved by Intermountain Representative, photographs, micrographs, or other authentic reproductions thereof.

12.4.10 INTERMOUNTAIN'S RIGHT TO STOP THE WORK. If the Contractor fails to correct Work or fails to carry out Work, as required by the Contract Documents or fails to comply with all required and customary safety precautions; Intermountain, by written order signed personally or by an agent specifically so empowered by Intermountain in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Intermountain to stop the Work shall not give rise to a duty on the part of the Intermountain to exercise this right for the benefit of the Contractor or any other person or entity

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INTERMOUNTAIN HEALTHCARE ACCESS AND CONFIDENTIALITY AGREEMENT

SECTION 1.0 PURPOSE AND DEFINITION

- 1.1 **Purpose of this Agreement.** Federal and state laws, as well as Intermountain's policies, protect Confidential Information, assure that it remains confidential, and permit it to be used for appropriate purposes. Those laws and policies assure that Confidential Information, which is sensitive and valuable, remains confidential. They also permit you to use Confidential Information only as necessary to accomplish legitimate and approved purposes. You need access to Confidential Information because you have one of the following roles:
- A. An Intermountain Workforce member, which includes volunteers (a "Workforce Member"); or
 - B. An Intermountain-affiliated or Intermountain-credentialed Provider (a "Provider"); or
 - C. A vendor or agent of IHC Health Services, Inc. (a "Vendor" or "Agent").
- 1.2 **Definition.** "Confidential Information" means data proprietary to Intermountain, other companies, or other persons, plus any other information that is private and sensitive and which Intermountain has a duty to protect. You may learn or access Confidential Information through oral communications, paper documents, computer systems, or through your activities at or with Intermountain. Examples of Confidential Information include the following information that is maintained by, or obtained from, Intermountain:
- A. An individual's demographic, employment, or health information;
 - B. Peer-review information;
 - C. Intermountain's business information, (e.g., financial and statistical records, strategic plans, internal reports, memos, contracts, peer review information, communications, proprietary computer programs, source code, proprietary technology, etc.); and
 - D. Intermountain's or a Third-party's information (e.g., computer programs, client and vendor proprietary information, source code, proprietary technology, etc.).

SECTION 2.0 YOUR DUTIES UNDER THIS AGREEMENT

- 2.1 **Principal Duties.** To qualify to access or use Confidential Information, you will comply with the laws and Intermountain policies governing Confidential Information. Your principal duties regarding Confidential Information include, but are not limited to, the following:
- A. Safeguard the privacy and security of Confidential Information;
 - B. Use Confidential Information only as needed to perform your legitimate and Intermountain-approved responsibilities. This means, among other things, that you will not:
 - (1) Access Confidential Information for which you have no legitimate need to know;
 - (2) Divulge, copy, release, sell, loan, revise, alter, or destroy any Confidential Information except as properly authorized within the scope of your legitimate and Intermountain-approved responsibilities; or
 - (3) Misuse Confidential Information;
 - C. Safeguard, and not disclose, your access code or any other authorization that allows you to access Confidential Information. This means, among other things, that you will:
 - (1) Accept responsibility for all activities undertaken using your access code and other authorization; and
 - (2) Report any suspicion or knowledge that you have that your access code, authorization, or any Confidential Information has been misused or disclosed without Intermountain's permission (Report this suspicion or knowledge to the Intermountain Compliance Hotline at 1-800-442-4845, or, if you are a member of Intermountain's Workforce, to your supervisor or facility compliance coordinator.);
 - D. Not remove Confidential Information from an Intermountain facility unless necessary for your legitimate and Intermountain-approved responsibilities (If removal of Confidential Information from an Intermountain facility is necessary, you will use reasonable and appropriate physical and technical safeguards—such as encrypting electronic Confidential Information.);
 - E. Report activities by any individual or entity that you suspect may compromise the confidentiality of Confidential Information (To the extent permitted by law, Intermountain will hold in confidence reports that are made in good faith about suspect activities, as well as the names of the individuals reporting the activities.);
 - F. Not use or share Confidential Information after termination of your role triggering the requirement to sign this Agreement (For example, if you are a Workforce Member, when you leave Intermountain's employment; if you are a Provider, when you lose your privileges at an Intermountain facility or your privileges to access Confidential Information; and if you are a Vendor or Agent, when you finish your assignment or project with Intermountain or when your company stops doing business with Intermountain, whichever is first.); and
 - G. Claim no right or ownership interest in any Confidential Information referred to in this Agreement.

SECTION 3.0 VIOLATION OF DUTY – CHANGE OF STATUS

- 3.1 **Responsibility.** You are responsible for your noncompliance with this Agreement.
- 3.2 **Discipline.** If you violate any provision of this Agreement, you will be subject to discipline, including but not limited to, the following:
- A. If you are a Workforce Member, to dismissal as a member of Intermountain's Workforce, loss of employment with Intermountain, termination of your ability to access Confidential Information, and legal liability;
 - B. If you are a Provider, a Vendor, or an Agent, to discipline, including revocation of your ability to access or use Confidential Information, and legal liability.
- 3.3 **Relief.** Any violation by you of any provision of this Agreement will cause irreparable injury to Intermountain that would not be adequately compensable in monetary damages alone or through other legal remedies, and will entitle Intermountain to the following:
- A. If you are a Workforce Member, or an Vendor or Agent, to preliminary and permanent injunctive relief, a temporary restraining order, and other equitable relief in addition to damages and other legal remedies; or
 - B. If you are a Provider, to a court order prohibiting your use of Confidential Information except as permitted by this Agreement, and Intermountain may also seek other remedies; and
- 3.4 **Authority.** Intermountain may terminate your access to Confidential Information if your status as a Workforce Member, Provider, Vendor, or Agent changes, if Intermountain determines that to be in the best interests of Intermountain's mission, or if you violate any provision of this Agreement.

SECTION 4.0 Continuing Obligations. Your obligations under this Agreement continue after termination of your status as a Workforce Member, Provider, Vendor, or Agent.

Printed Name: _____

Signature: _____ Date: _____

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Third Party Remote Access Form

Company Information

Date of request: _____

Company Name: _____

Contact Name: _____

Address: _____

City, State, Zip: _____

Phone: _____

Fax: _____

****NOTE:** The above stated company will notify Intermountain Healthcare and change any passwords or access codes into Intermountain's computer systems upon the termination of the Contact Name or other employees associated with the remote access process.

List all individuals who will be accessing Intermountain Healthcare's network (Name and DOB)

****NOTE:** All individuals who will be accessing Intermountain's network must sign the Trustee Confidentiality Agreement. Please attach all signed agreements for the individuals above to the request form.

INTERMOUNTAIN Contact Information

Facility: _____

Department: _____

Intermountain Healthcare
Steward: _____

Phone: _____

Business purpose for requesting access: _____

Type of access required (i.e., authority needed): _____

Please fax this form when completed and signed, along with completed and signed 3rd Party Confidentiality documents to the following number:

FAX: 801-442-0463



Intermountain Healthcare systems to be accessed (Host IP addresses, protocols and ports used, etc):

Time period for which access is requested:

Does Intermountain already have a signed Business Associate Agreement (BAA) in place with the 3rd party?

YES / NO

(Please check this at the following URL: <http://ihcweb/enterprise/compliance/hipaa/ba.php> If not, the Intermountain Steward will need to obtain one before access can be granted. For more information, please contact: privacy@intermountainmail.org, or the compliance hotline number at 1-800-442-4845)

Does Intermountain already have a support agreement with the appropriate confidentiality agreements signed and submitted?

YES / NO

(The Intermountain Steward is responsible for obtaining signed copies of the appropriate confidentiality agreement for each individual from the 3rd party company that will be accessing Intermountain's Information Systems)

Additional Comments:

To be completed by Intermountain Healthcare's Corporate IS Security Team

Security/Access Concerns:

Access into Intermountain Healthcare's computer systems is monitored and reviewed on a regular basis. Intermountain reserves the right to cancel access to all entities at any time if it feels there is a possible security breach or risk that requires immediate disconnection. Further, all access into Intermountain's computer systems is bound to the current confidentiality and appropriate usage policies in effect.

Your signatures below act as your acknowledgement and agreement to these policies.

Vendor Contact Signature

Intermountain Healthcare
Steward Signature

Request Approved by:

Intermountain Corporate IS Security

Date Approved

DIVISION 1 - GENERAL REQUIREMENTS

Section 01 1000	Summary of Work
Section 01 1900	Definitions and Standards
Section 01 2600	Contract Modification Procedures
Section 01 2900	Payment Procedures
Section 01 3100	Project Management and Coordination
Section 01 3313	Submittals
Section 01 5050	Temporary Facilities and Controls
Section 01 6000	Product Requirements
Section 01 7300	Execution Requirements
Section 01 7700	Closeout Procedures
Section 01 7820	Operation and Maintenance Data

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SECTION 01 1000

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Requirements of Division 0 "**Procurement and Contracting Requirements**" and Division 1 "**General Requirements**" apply to every section contained in the Project Manual, and shall govern the execution of Work required by the Contract Documents.
- B. Provide everything necessary for and incidental to proper and satisfactory completion of all Work specified and indicated or shown in the Contract Documents.
- C. **The Project consists** of renovations at the existing Stevens-Henager College building to accommodate new offices.

1.2 PROJECT LOCATION

- A. **Facility is located** at 383 West Vine, Murray, Utah.

1.3 SEPARATE CONTRACTS

- A. **The Owner may enter into separate contracts for construction.** Each contractor shall be responsible to coordinate efforts with other trade contractors to ensure timely completion of the work.
- B. **Coordinate the Work** of this contract with the work of separate contractors to ensure timely completion of the work.

1.4 CODES

- A. **Law of place of building governs.** Conform to applicable requirements of the latest editions of the International Building Code, International Building Code Standards, International Mechanical Code, International Plumbing Code, National Electrical Code, National Fire Protection Association requirements, local ordinances, and OSHA requirements applicable to this project, unless a higher standard is called for, without additional cost to the Owner.
- B. **Comply with CABO/ANSI A117.1**, American National Standard, "Accessible and Usable Buildings and Facilities" latest edition which is in force for the project location, for handicapped accessibility.

1.5 CONTRACTOR USE OF PREMISES

- A. **General:** During the construction period the Contractor shall have limited use of the premises for construction operations, including:
 - 1. The Contractor's use of the premises is limited by the Owner's right to conduct business as usual in occupied portions of the building, perform work or to retain other contractors on portions of the Project.

- B. **Use of the Site:** Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
1. **Driveways and Entrances:** Keep driveways and entrances serving the premises clear and available to the Owner and Owner's employees and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
 2. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated. If additional storage is necessary obtain and pay for such storage off-site.
 3. Lock automotive type vehicles such as passenger cars and trucks and other types of mechanized and motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.

1.7 OWNER'S OCCUPANCY REQUIREMENTS

- A. **Partial Owner Occupancy:** Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's 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.
- B. **Owner Access to Completed Areas of Construction:** Owner reserves the right to place and install equipment in completed areas of building, before Substantial Completion, provided such placement does not interfere with completion of the Work. Such placement of equipment shall not constitute acceptance of the total Work.
1. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.8 WORK RESTRICTIONS

- A. **On-Site Work Hours:** Work shall be generally performed inside the existing building during normal business working hours of 7:30 a.m. to 7:00 p.m., Monday through Friday, and 9:00 a.m. to 6:00 p.m. Saturday, except otherwise indicated.
1. **Weekend Hours:** Contractor shall not work on Sundays.
 2. **Hours for Utility Shutdowns:** Shall not occur during Owner's business hours.
 3. **Hours for Core Drilling and Slab Removal:** Consult with Owner as to best times. Work shall be scheduled with Owner not less than 24 hours in advance of proposed noisy activity.
- 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 Architect and Owner not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Architect's written permission.

1.9 INCIDENTAL WORK

- A. **Any work**, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be supplied by the Contractor at no additional cost to the owner whether or not specifically called for in the Contract Documents.
- B. The Owner's "**Responsibility Matrix**" follows this section. Provide equipment and services as part of the Work as noted in Matrix.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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RESPONSIBILITY MATRIX

The following list identifies the majority of the items that are part of the interior build-out.

ITEM	STATUS - Furnished / Installed	NOTES	Additional Notes		
			Data	Power	Backing
OFOI					
Art	Owner / Vendor				
Brochure Racks	Owner / Vendor	G.C. to provide proper backing			
Chart Racks	Owner / Vendor (Midwest-Peter Pepper)	G.C. to provide proper backing			
Copiers, fax	Owner / Vendor		Yes	Yes	
Cup Dispensers	Owner / Vendor				
Exam Tables	Owner / Vendor		Yes		
IV Track	Owner / Vendor				
Moveable Furniture	Owner / Vendor (Midwest Furn.)	Coordinate Modesty Panels with Elec. Outlets.			
Moveable Metal Shelving	Owner / Vendor				
Patient Lifts	Owner / Vendor (Liko-Hill Rom)	G.C. to Coordinate shop drawings and Installation. Connect to Equipment branch if provided.		Yes	
Radiation Protection Certification	Owner / Vendor (Medical Physics Consultants)	G.C. to coordinate prior to Gyp.install.			
Recliners / Draw Chairs	Owner / Vendor				
Signage - Exterior	Owner / Vendor (IG Signs, YESCO)	G.C. to provide & coordinate thru-wall conduit sleeves. Intermountain Logo Signs - (2) 20A Circuits InstaCare and other Signs - (1) 20 A Circuits			Yes
Signage - Interior	Owner / Vendor (Scribbly, Hitech or Chris Johnson)				
Radiology Equipment (X-Ray)	Owner / Vendor (Kellie Andersen)		Yes	Yes	
Clinical Garbage Cans (Clinical, Office, PT, Etc.)	Owner / Owner				
Computers, Printers, Scanners	Owner / Owner	In-ceiling & wall mounts, conduits and boxes mounted by G.C.	Yes	Yes	
Coat Hooks (Offices only)	Owner / Owner				
Keyboard Trays	Owner / Owner				
PACS	Owner / Owner				
OFCI - (Coordinate location of items with Owner/Users)					
Time Clocks	Owner / Contractor	Conduit and boxes by G.C., Coordinate location with Owner	Yes	Yes	
Emergency Phones	Owner / Contractor	Conduit and boxes by G.C.	Yes	Yes	
Ergotron Brackets	Owner / Contractor	Location coordinated during mockup	Yes	Yes	Yes
Paper Towel Dispensers	Owner / Contractor	Location coordinated during mockup			
Soap Dispensers	Owner / Contractor	Location coordinated during mockup			
Toilet Paper Dispensers	Owner / Contractor	Location coordinated during mockup			
Glove Dispensers	Owner / Contractor	Location coordinated during mockup			
Hand Sanitizer Dispensers (Avaguard)	Owner / Contractor	Location coordinated during mockup			
Otosopes	Owner / Contractor	Location coordinated during mockup		Yes	
Sharps Disposals	Owner / Contractor	Location coordinated during mockup			
Procedure Lights	Owner / Contractor	Location coordinated during mockup		Yes	
Scrub Sinks (Carriers)	Owner / Contractor	G.C. to coordinate with Owner for ordering for Install coord.			
Operating Room Boom Mounting Plates	Owner / Contractor	G.C. to coordinate with Owner for ordering for Install coord.			
Digital Projectors, TV's	Owner / Owner	In-ceiling & wall mounts, conduits and boxes mounted by G.C.	Yes	Yes	Yes
UPS	Owner / Contractor	Verify location with Owner		Yes	
CFCI					
Blinds/Shades (manual and powered)	Contractor / Contractor			Yes	
Boom Mounting Plates (Equipment, Lighting, Anesthesia)	Contractor / Contractor	Coordinate with Owner/User on Mounting plates			
Clinical Clocks	Contractor / Contractor			Yes	
Coat and Robe Hooks (Heavy Duty in Radiology)	Contractor / Contractor				Yes
Custom White Boards	Contractor / Contractor	Coordinate with Owner			Yes
Standard white / cork boards	Contractor / Contractor	Coordinate with Owner			Yes
Building Alarms / Refrigerator Alarm System	Contractor / Contractor	Stub conduit into accessible ceiling for access.		Yes	
Cubicle curtains & Tracks; Shower Curtains, Rods & Hangers	Contractor / Contractor (Medline or C/S)	GC to use Medline "On the Right Track" or C/S "Qwik Track"			
Med Gas Certification	Contractor / Contractor	Coordinate vendor with Owner			
Nurse Call System	Contractor / Contractor		Yes	Yes	
Diaper Changing Station	Contractor / Contractor				Yes
Emergency Shower Station/Eye Wash	Contractor / Contractor				
Fire Extinguishers	Contractor / Contractor				
Grab Bars (Rest rooms, Radiology, etc.)	Contractor / Contractor				Yes
Mirrors (Rest rooms, Exams, Radiology, etc.)	Contractor / Contractor				
Pneumatic Tube Systems	Contractor / Contractor (SwissLog)	Use Swisslog and verify pricing is per Amerinet Contract Agreement. Design fees are included in this agreement.		Yes	
Plumbing Shrouds	Contractor / Contractor				
Sanitary Napkin Dispensers/Receptacles	Contractor / Contractor				
Security Cameras	Contractor / Contractor (AlphaCorp)	Coordinate final location with Owner.	Yes		
Voice/Data Cabling	Contractor / Contractor (Cache Valley Elec., IES Commercial, Americom)	Coordinate with Owner/User on connections, pairs of fiber/copper, conduits, inner-ducts.	Yes		
Unistrut in Radiology	Contractor / Contractor	G.C. to provide shop drawings to Design Team for attachment details into structure, not into metal deck.			
Wall Protection (Incl. Bumper and Corner Guards)	Contractor / Contractor				

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SECTION 01 1900

DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. **Definitions:** Basic Contract definitions are included in the General Conditions.
1. **Directed:** Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean "directed by the Architect", "requested by the Architect", and similar phrases. However, no implied meaning shall be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.
 2. **Approve:** The term "approved," where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the duties and responsibilities of the Architect as stated in General and Supplementary Conditions. Such approval shall not release the Contractor from responsibility to fulfill Contract requirements unless otherwise provided in the Contract Documents.
 3. **Furnish:** The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."
 4. **Install:** The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."
 5. **Provide:** The term "provide" means "to furnish and install, complete and ready for the intended use."
 6. **Protect:** Except as otherwise defined in greater detail, the term "protect" is used to describe the process of shielding from harm existing fixtures, elements or materials.
 7. **Stabilize:** To apply measures designed to reestablish a weather-resistant enclosure and the structural reinforcement of an item or portion of the building while maintaining the essential form as it exists at present.
 8. **Protect and Maintain:** To remove deteriorating corrosion, reapply protective coatings, and install protective measures such as temporary guards; to provide the least degree of intervention.
 9. **Remove:** To detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
 10. **Remove and Salvage:** To detach items from existing construction and deliver them to Owner ready for reuse.
 11. **Remove and Reinstall:** To detach items from existing construction, repair and clean them for reuse, and reinstall them where indicated.
 12. **Existing to Remain or Retain:** Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled.
 13. **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.

- B. **Specification Format and Conventions:**
1. **Specification Format:** The Specifications are organized into Divisions and Sections using the 49-division format and CSI/CSC's "MasterFormat" numbering system.
 - a. **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. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
 2. **Specification Content:** The Specifications use certain conventions for style of language and the intended meaning of terms, words, and phrases when used in particular situations. These conventions are as follows.
 - a. **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.
 - b. **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.
 - 1) 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.
- C. **Drawing Symbols:**
1. **Graphic symbols:** Where not otherwise noted, symbols are defined by "**Architectural Graphic Standards**", published by John Wiley & Sons, Inc., **latest edition**.
 - a. **Mechanical/Electrical Drawings:** Graphic symbols used on mechanical and electrical Drawings are generally aligned with symbols recommended by ASHRAE. Where appropriate, they are supplemented by more specific symbols recommended by technical associations including ASME, ASPE, IEEE, and similar organizations. Refer instances of uncertainty to the Architect for clarification before proceeding.
- D. **Industry Standards:**
1. **Applicability of Standards:** Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference. Individual Sections indicate which codes and standards the Contractor must keep available at the Project Site for reference.
 2. **Publication Dates:** Where the date of issue of a referenced standard is not specified, comply with the standard in effect as of date of Contract Documents.
 3. **Conflicting Requirements:** Where compliance with two or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the Contract Documents indicate otherwise. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Architect for a decision before proceeding.

4. **Copies of Standards:** Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
- a. **Where copies of standards are needed** for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.
 - b. **Although copies of standards needed** for enforcement of requirements also may, be included as part of required submittals, the Architect reserves the right to require the Contractor to submit additional copies as necessary for enforcement of requirements.

- E. **Abbreviations and Names:** Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision.

END OF SECTION

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SECTION 01 2600

CONTRACT MODIFICATION 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 specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. **Related Sections include the following:**
 - 1. Section 01 6000 "**Product Requirements**" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. **Architect will issue supplemental instructions** authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on forms issued by the Architect or the Owner.

1.4 PROPOSAL REQUESTS

- A. **Owner-Initiated Proposal Requests:** Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- B. **Contractor-Initiated Proposals:** If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to the Architect.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. **Proposal Request Form:** Use forms issued by the Architect or the Owner.

1.5 CHANGE ORDER PROCEDURES

- A. **On Owner's approval of a Proposal Request,** Contractor shall generate Change Orders on a monthly basis.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. **Construction Change Directive:** Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. **Documentation:** Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 – PRODUCTS - NOT USED

PART 3 – EXECUTION - NOT USED

END OF SECTION

SECTION 01 2900

PAYMENT 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 specifies** administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. **Related Sections** include the following:
 - 1. Section 01 2600 "**Contract Modification Procedures**" for administrative procedures for handling changes to the Contract.

1.3 DEFINITIONS

- A. **Schedule of Values:** A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. **Coordination:** Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - 2. Application for Payment forms with Continuation Sheets.
 - 3. Submittals Schedule.
 - 4. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
 - 5. Sub-schedules: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
- B. **Format and Content:** Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
 - a. Include line items for Commissioning under principal subcontract amounts, where appropriate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. **General:** Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. **Payment Application Times:** The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. **Payment Application Forms:** Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

- D. **Application Preparation:** Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. **Transmittal:** Submit **one signed and notarized original copy** of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. **Application for Payment at Substantial Completion:** After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete, including commissioning and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

PART 2 – PRODUCTS - NOT USED

PART 3 – EXECUTION - NOT USED

END OF SECTION

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SECTION 01 3100

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. General project coordination procedures.
 - 2. Conservation.
 - 3. Coordination Drawings.
 - 4. File Transfer.
 - 5. Administrative and supervisory personnel.
 - 6. Project meetings.
- B. **Contractor must participate** in coordination requirements.
- C. **Related Sections:** The following Sections contain requirements that relate to this Section:
 - 1. Section 01 7300 "**Execution Requirements**" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 2. Section 01 7700 "**Closeout Procedures**" for coordinating Contract closeout.

1.3 COORDINATION

- A. **Coordination:** Coordinate construction operations included in various 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.
- B. **Memoranda:** If necessary, 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.
- D. **Administrative Requirements:** Contractor shall submit all project related information (i.e. submittals, RFI's, ASI's, addenda, construction documents, project logs, field reports, and meeting minutes) using the Owner's Submittal Exchange. Architect will provide access information to the Contractor at the pre-construction meeting or as appropriate to the schedule of the project.
1. Contractor shall employ a PDF review software system such as Blue Beam (www.bluebeam.com) or another similar system for producing, formatting, and marking-up project related documents. Contractor shall review all the documents and add their stamp and comments directly to the PDF prior to posting for the Architect to review.
 2. Contractor shall provide to the Architect and Owner an electronic archive of all data at the end of the project via DVD(s) for final project records.
- E. **Contractor is to keep a printed record** of all Construction Documents including all clarifications, RFI's and approved changes to the Contract on site.
- F. **Conservation:** Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

1.4 SUBMITTALS

- A. **Staff Names:** Within 5 business days of starting construction operations, submit a list of principal staff 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.
- B. **Submittal Log:** See section 'Submittals' for electronic delivery and record keeping.
- C. **Coordination Drawings:** Provide complete coordination drawings as specified in "Coordination Meetings and Submittals".

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. **General:** In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
- B. **Perform project quality control** in accordance with requirements specified in Related Sections, including:
 - 1. Division 1 Section "Quality Control Services".
 - 2. Division 1 Section "Construction Waste Management and Disposal".

1.6 CONSTRUCTION PROGRESS DOCUMENTATION

- A. **Progress Photographs:**
 - 1. Photographically document site conditions prior to start of construction operations.
 - 2. Take weekly photographs throughout the entire project. Photographs shall be provided for unrestricted use by Owner.
 - a. Indicate photographs demonstrating environmental procedures.

1.7 PROJECT MEETINGS

- A. **General:** Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - 1. **Attendees:** Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 - 2. **Agenda:** Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. **Minutes:** Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.
- 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; manufacturers; 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.
 - d. Designation of responsible personnel.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for processing Applications for Payment.
 - g. Distribution of the Contract Documents.
 - h. Submittal procedures.
 - i. Preparation of Record Documents.

- j. Use of the premises.
 - k. Responsibility for temporary facilities and controls.
 - l. Parking availability.
 - m. Office, work, and storage areas.
 - n. Equipment deliveries and priorities.
 - o. First aid.
 - p. Security.
 - q. Progress cleaning.
 - r. Working hours.
3. **Documentation:** Furnish Architect certificate of insurance naming VCBO as an additional insured.
- C. **Progress Meetings:** Conduct progress meetings at intervals as agreed by Owner, Contractor and Design Professionals. Coordinate dates of meetings with preparation of payment requests.
- 1. **Reporting:** Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
 - 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.

1.8 REQUESTS FOR INFORMATION (RFI)

- A. **Procedure:** Immediately on discovery of the need for interpretation of Contract Document, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
- 1. RFIs shall be submitted by the Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
 - 3. Contractor is to keep a printed record of all RFI's and post them on the 'Record Drawings' kept on site.
- B. **Content of the RFI:** Include a detailed, legible description of item needing interpretation and the following:
- 1. Project name.
 - 2. Date.
 - 3. Name of Contractor.
 - 4. Name of Architect and Owner.
 - 5. RFI number, numbered sequentially.
 - 6. Specification Section number and title and related paragraphs, as appropriate.
 - 7. Drawing number and detail references, as appropriate.
 - 8. Field dimensions and conditions, as appropriate.
 - 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contractor Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 10. Contractor's signature.
 - 11. **Attachments:** Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thickness, structural grid references, and details of affected materials, assemblies, and attachments.

- C. **Electronic RFI's:**
1. RFI's shall be processed and delivered electronically through web-based RFI processing software (via Owner's Submittal Exchange).
 2. Identify each page of attachments with the General Contractors RFI number and sequential page number.
 3. Attachments shall be electronic files in PDF format.
- D. **Architect's Action:** Architect will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFI's received after 1:00 p.m. will be considered as received the following working day.
1. The following RFI's will be returned without action:
 - a. Requests for approval of submittals.
 - b. Request for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Request for adjustments in the Contract Time or Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFI's or RFI with numerous errors.
 2. Architect's action may include a request for additional information, in which case Architect's Time for response will start again.
 3. Architect's action on RFI that may result a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Owner in writing within 10 calendar days of receipt of the RFI response.
- E. **On receipt of Architect's Owner's action,** update the RFI log and immediately distribute the RFI response to the affected parties. Review response and notify Architect and Owner within seven calendar days if Contractor disagrees with response.
- F. **RFI Log:** Prepare, maintain, and submit a tabular log of RFI's organized by RFI number. Submit log monthly.
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect and Owner.
 4. RFI number including RFI's that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's and Owner's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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SECTION 01 3313

SUBMITTALS

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 specifies **administrative and procedural requirements for submittals** required for performance of the Work, including:
1. Contractor's construction schedule.
 2. Daily construction reports.
 3. Shop Drawings.
 4. Product Data.
 5. Samples.
 6. Delegated Design/Deferred Submittals for review by the Building Code Official.
- B. **Administrative Submittals:** Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
1. Applications for payment.
 2. Performance and payment bonds.
 3. Insurance certificates.
 4. List of Subcontractors.
- C. **Related Sections:**
1. Section 01 3100 "**Project Management and Coordination**" for electronic web-based construction administration software (using Owner's Submittal Exchange).

1.3 ELECTRONIC SUBMITTAL DELIVERY

- A. **To minimize printing reimbursables**, shipping reimbursables and the impact on the environment, process and deliver submittals electronically through Submittal Exchange.
1. One complete hard copy of each submittal shall also be furnished for verification of the completeness of electronic submission, if requested by Architect.
- B. **Construction Manager or General Contractor** must first review and approve submittals sent by Subcontractors prior to sending to Architect. Include Contractor's certification that information complies with Contract Document requirements; record deviations from Contract Document requirements, including minor variations and limitations.
1. Contractor shall coordinate numbering system and nomenclature with Architect prior to first submissions.
 2. Email notifications of items delivered to Submittal Exchange shall be sent to both the project manager and the appropriate administrative assistant in the Architect's office simultaneously with posting to Submittal Exchange.

- C. **Submittals must follow the requirements outlined** in this specification and as required in individual specification sections.
- D. **Deliver the following** to the Architect electronically in pdf format:
1. Product Data
 2. Shop Drawings
 3. Certifications
 4. Test Data
 5. Schedules
 6. Calculations
 7. Mix Designs
 8. Warranty Information
- E. **Samples and Color Selection**
1. Log physical samples via Submittal Exchange, but deliver by mail or courier to the Architect for review.
 2. Samples and color selection will not be reviewed electronically.
 3. See separate specification sections for quantities and sample selection process. The Architect shall return review comments via the Architect's File Transfer Site.
- F. **Submittal Stamps**
1. Contractor or Construction Manager shall affix an electronic stamp to PDF submittals.
- G. **Submittal Logs**
1. Architect shall maintain a submittal log through Submittal Exchange, however, General Contractor or Construction Manager shall be responsible for maintaining the official submittal log.

1.4 SUBMITTAL PROCEDURES

- A. **No submittal will be accepted** by the Architect **without the General Contractor's action stamp**, clearly visible, indicating that the submittal has been fully reviewed by the General Contractor for compliance to the Construction Documents.
- B. **Submittals with the General Contractor's stamp but not in compliance** with the Construction Documents will be deemed incomplete and returned without review. These will not be shown as received.
- C. **Coordination:** Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
1. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- D. **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.
1. Initial Review: Allow 14 calendar days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 21 calendar days for initial review of each submittal.
 3. Deferred Submittal Review: Where deferred submittals are required by the Building Code Official allow review time as dictated by the Official.
 4. If intermediate submittal is necessary, process it in same manner as initial submittal.
 5. Allow 14 calendar days for processing each resubmittal.
 6. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- E. **Submittal Preparation:** Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. Include the following information on the 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.
- F. **Submittal Transmittal:** Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.
1. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
- G. **Submittal requirements** for electronic PDF submittals:
1. Create submittals with native PDF files whenever possible. Do not print a PDF file, and scan in as an image file, as this will delete all file search functions typically embedded within a native PDF file.
 2. Break down PDF submittals by individual specification section. Do not collate multiple specification sections together into one non-separated submittal package (i.e. carpet, VCT, rubber base, and entry mats; though frequently provided by one installer, shall not be submitted as one non-separated package unless formatted as described below.)
 3. All PDF submittals that cover multiple items within one specification section, or PDF submittals that include multiple related specification sections shall have an index and be formatted with electronic book marks to distinguish various components from one another, and make each item easily retrievable without navigating through each page of an entire submittal.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. **Bar-Chart Schedule:** Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule.
1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".
 2. Within each time bar indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
 3. Prepare the schedule on a sheet of sufficient width to show data for the entire construction period.
 4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.
 5. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.
 6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.
- B. **Distribution:** Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. **Schedule Updating:** Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.6 DAILY CONSTRUCTION REPORTS

- A. **Daily Construction Report:** Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Architect at weekly intervals:
1. List of subcontractors at the site.
 2. Approximate count of personnel at the site.
 3. High and low temperatures, general weather conditions.
 4. Accidents and unusual events.
 5. Meetings and significant decisions.
 6. Stoppages, delays, shortages, losses.
 7. Meter readings and similar recordings.
 8. Orders and requests of governing authorities.
 9. Change Orders received, implemented.
 10. Services connected, disconnected.

- B. **Material Location Reports:** At monthly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. **Field Condition Reports:** Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

1.7 SPECIAL REPORTS

- A. **General:** Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. **Reporting Unusual Events:** When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1.8 SHOP DRAWINGS

- A. **Submit newly prepared information,** drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings.
- B. **Shop Drawings include** fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
 - 1. Dimensions.
 - 2. Identification of products and materials included.
 - 3. Compliance with specified standards.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement.
- C. **Sheet Size:** Submit Shop Drawings, layout drawings and other Revit or CADD style sheets formatted for 24 x 36 inch or 30 x 42 inch sheets. Details and drawings are to match or exceed construction bid document scales. All drawings are to be submitted to scale. All other product brochures and cut sheets can be provided in an 8-1/2 x 11 format.
- D. **Final Electronic Submittal:** Submit 2 prints, one for the Architect and one for the Owner at the end of the project or as requested by the parties during construction.
 - 1. If submittal was reviewed by members of the design team other than the Architect, provide an additional copy of the submittal for each design firm.
 - 2. The prints shall be marked-up and maintained as a "Record Document".

1.9 DELEGATED DESIGN/DEFERRED SUBMITTALS

- 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 Services Certification:** In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, 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.
- C. **Refer to the General Information sheet** on the Drawings for a list of required delegated design/deferred submittals.
- D. **Submit deferred submittals** on same size sheet as original drawings (30 x 42 or 8 1/2 x 11). Drawings and calculations shall be on the Design Professional's title block stating the project name and all other items specified under 'Submittal Preparation' above.
- E. **Furnish deferred submittals to the Architect** who will electronically submit to the Building Code Official for review as required by the IBC.
- F. Contractor shall include these submittal sheets in the Record Documents.

1.10 PRODUCT DATA

- A. **Submit in timely manner** to complete project, but **no later than 90 days** after Notice of Award.
- B. **Collect Product Data into a single submittal** for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."
1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with recognized trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
- C. **Do not submit Product Data until** compliance with requirements of the Contract Documents has been confirmed.

- D. **Submittals:** Submit 4 copies of each required submittal; submit 6 copies where required for maintenance manuals. The Architect will retain one, and will return the other marked with action taken and corrections or modifications required.
- E. **Electronic Submittals:** Submit a pdf copy of each required submittal; include copies where required for maintenance manuals. See electronic submittal delivery and submittal procedures for further requirements

1.11 SAMPLES

- A. **Submit in timely manner** to complete project, but **no later than 90 days** after Notice of Award.
- B. **Samples:** Submit full-size, fully fabricated samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.
- C. **Submittals:** Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.
 - 1. Maintain sets of samples and a file of product submittals, as returned, at the Project site, for quality comparisons and product verification throughout the course of construction.

1.12 CONTRACTOR'S REVIEW

- A. **Contractor's Review:** Review each submittal and check 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.
- C. **Submittals not marked** with an approval stamp and those not in compliance with the Construction Documents shall be returned without further review. It is the Contractor's responsibility to review submittals for compliance prior to forwarding the submittal to the Design Team for review.

1.13 ARCHITECT'S ACTION

- A. **Architect's Action:** Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly.
 - 1. Compliance with specified characteristics is the Contractor's responsibility.

- B. **Action Stamp:** The Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked to indicate the action taken.
1. Corrections or comments made on the shop drawings during this review do not relieve the Contractor from compliance with requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for; confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01 5050

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section **specifies administrative and procedural requirements** for temporary services and facilities, including such items as temporary utility services, temporary construction and support facilities, and project security and protection.
- B. **Temporary construction and support facilities** required for the project include but are not limited to the following:
 - 1. Sanitary facilities, including drinking water.
 - 2. Hoists.
 - 3. First aid station.
 - 4. Waste disposal services.
 - 5. Construction aids and miscellaneous general services and facilities.
- C. **Security and protection facilities** and services required for the project include but are not limited to the following:
 - 1. Temporary fire protection.
 - 2. Barricades, warning signs, lights.
 - 3. Enclosure fence for stored material.
 - 4. Environmental protection.

1.2 QUALITY ASSURANCE

- A. **Regulations: Comply with requirements** of local laws and regulations governing construction and local industry standards, in the installation and maintenance of temporary services and facilities, including but not limited to the following:
 - 1. Building codes, including requirements for permits, testing and inspection.
 - 2. Health and safety regulations.
 - 3. Utility company regulations and recommendations governing temporary utility services.
 - 4. Environmental protection regulations governing use of water and energy, and the control of dust, noise and other nuisances.
- B. **Standards:** Comply with the requirements of NFPA Code 241, "Building Construction and Demolition Operations", and ANSI A-10 Series standards for "Safety Requirements for Construction and Demolition", and the NECA National Joint Guideline NJG-6 "Temporary Job Utilities and Services."
- C. Refer to the most current "**Guidelines for Bid Conditions for Temporary Job Utilities and Services**", as prepared jointly by AGC and ASC industry recommendations.

1.3 JOB CONDITIONS

- A. **General:** Provide each temporary service and facility ready for use at each location when the service or facility is first needed to avoid delay in the performance of the work. Maintain, expand as required and modify temporary services and facilities as needed throughout the progress of the Work. Do not remove until services or facilities are no longer needed, or are replaced by the authorized use of completed permanent facilities.

- B. **Conditions of Use:** Operate temporary services and facilities in a safe and efficient manner. Do not overload temporary services or facilities, and do not permit them to interfere with the progress of the work. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on the site.
1. **Temporary Construction and Support Facilities:** Maintain temporary facilities in such a manner as to prevent discomfort to users. Take necessary fire prevention measures. Maintain temporary support facilities in a sanitary manner so as to avoid health problems and other deleterious effects.
 2. **Security and Protection:** Maintain site security and protection facilities in a safe, lawful and publicly acceptable manner. Take necessary measures to prevent erosion of the site.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. **General:** Provide new materials and equipment for temporary services and facilities, used materials and equipment that are undamaged and in serviceable condition may be used, if acceptable to the Architect.
- B. **Temporary Construction and Support Facilities:** Provide facilities that can be maintained properly throughout their use at the project site.
- C. **Temporary Offices and Similar Construction:** For temporary offices, fabrication shops, storage sheds and similar construction, provide either standard prefabricated or mobile units or the equivalent job-built construction.
1. **Self-contained Toilet Units:** Provide single-occupant self-contained toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar non-absorbent material.
 2. **Tarpaulins:** Provide waterproof, fire-resistant, UL labeled tarpaulins with a flame-spread rating of 15 or less.
 3. **First Aid Supplies:** Comply with governing regulations and recognized recommendations within the construction industry.
 4. **Drinking Water:** Provide potable water approved by local health authorities.
 5. **Sign Materials:** For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thicknesses indicated. Provide exterior grade acrylic-latex-base enamel for painting panels and applying graphics.
- D. **Fire Extinguishers:** Provide type "A" fire extinguishers for temporary offices and similar spaces where there is a minimal danger of electrical or grease-oil-flammable liquid fires. In other locations provide type "ABC" dry chemical extinguishers, or a combination of several extinguishers of NFPA recommended types for the exposures in each case.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. **General:** Use qualified tradesmen for installation of temporary services and facilities. Locate temporary services and facilities where they will serve the entire project adequately and result in minimum interference with the performance of the Work.
1. Relocate, modify and extend services and facilities as required during the course of work so as to accommodate the entire work of the project.

3.2 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

- A. **General:** Provide a reasonably neat and uniform appearance in temporary construction and support facilities acceptable to the Architect/Engineer and the Owner.
1. Locate field offices, storage and fabrication sheds and other support facilities for easy access to the Work. Position offices so that windows give the best possible view of construction activities.
 2. Maintain field offices, storage and fabrication sheds, temporary sanitary facilities, waste collection and disposal systems, and project identification and temporary signs until near substantial completion. Immediately prior to substantial completion remove these facilities.
- B. **Sanitary Facilities:** Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with governing regulations including safety and health codes for the type, number, location, operation and maintenance of fixtures and facilities; provide not less than specified requirements. Install in locations that will best serve the project's needs.
1. Sanitary facilities located within the existing facility will not be permitted to be used by the Contractor.
- C. **Hoists:** Provide adequate facilities for hoisting materials and employees. Do not permit employees to ride hoists which comply only with requirements for hoisting materials. The Contractor is responsible for selection of type, size, and number of facilities. Truck cranes and similar devices used for hoisting are considered as being "tools and equipment" and not temporary facilities.
- D. **Collection and Disposal of Wastes:**
1. Establish a system for daily collection and disposal of waste or extraneous materials from all construction areas on site that may present a hazard to the project, its craftsmen and the expeditious construction of the work. The Contractor shall provide to the Owner a satisfactory method to assure clean-up is performed in a timely and expeditious fashion. Enforce requirements strictly. Do not hold collected materials at the site longer than 1 day. Handle waste materials that are hazardous, dangerous, or unsanitary separately from other inert waste by containerizing appropriately. Dispose of waste material in a lawful manner.
 - a. Burying or burning of waste materials on the site will not be permitted.
 - b. Washing waste materials down sewers or into waterways will not be permitted.
 - c. Provide rodent proof containers located on each floor level of construction work, to encourage depositing of lunch garbage and similar wastes by construction personnel.
 2. The Owner reserves the right to withhold payments and perform the clean-up, if necessary, at the expense of the Contractor, if unsatisfactory clean-up efforts are not performed in a timely fashion.
- E. **Construction Aids and Miscellaneous Services and Facilities:**
1. Design, construct, and maintain construction aids and miscellaneous general services and facilities as needed to accommodate performance of the work. Construction aids and miscellaneous general services and facilities include, but or not limited to the following:
 - a. Temporary stairs and ladders.
 - b. Guardrails and barriers.
 2. Stairs: Provide temporary stairs where ladders are not adequate for performance of work.
 3. Guardrails and Barriers: Provide guardrails at all unprotected edges of floor and roof openings, and at perimeter of roof and unenclosed floors.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. **General:** Provide a reasonably neat and uniform appearance to security and protection facilities acceptable to the Architect/Engineer and the Owner.
- B. **Temporary Fire Protection:**
1. Install and maintain temporary fire protection facilities of the types needed to adequately protect against reasonably predictable and controllable fire losses. Comply with applicable recommendations of the NFPA Standard 10 "Standard for Portable Fire Extinguishers". Locate fire extinguishers where they are most convenient and effective for their intended purpose. Store combustible materials in containers in recognized fire-safe locations.
 2. Develop and supervise an overall fire prevention and first-aid fire protection program for personnel at the project site. Review needs with the local fire department officials and establish procedures to be followed. Instruct personnel in methods and procedures to be followed. Post warnings and information and enforce strict discipline. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking of any kind on school property. Provide supervision of welding operations, and similar sources of ignition for possible fires.
- C. **Security Enclosure and Lockups:**
1. Install general temporary enclosure of partially completed areas of construction. Provide locking entrances adequate to deter unauthorized entrance, vandalism, theft and similar deleterious effects of violations of project security.
 2. Storage: Where materials and equipment must be temporarily stored, prior to and during construction, and are of substantial value or are attractive for possible theft, provide a secure lockup and enforce strict discipline in connection with the timing of installation and release of materials, so that the opportunity for theft and vandalism is minimized.
- D. **General Environmental Protection:** Provide general protection facilities, operate temporary facilities, conduct construction activities, and enforce strict discipline for personnel on the site in ways and by methods that comply with environmental regulations, and that minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result from the performance of work at the site. Avoid the use of tools and equipment which produce harmful noise. Restrict the use of noise making tools and equipment to hours of use that will minimize noise complaints from persons and firms near the project site.

3.4 OPERATION, TERMINATION AND REMOVAL

- A. **Supervision:** Enforce strict discipline in use of temporary services and facilities at the site. Limit availability of temporary services and facilities to essential and intended uses to minimize waste and abuse. Do not permit temporary installations to be abused or endangered. Do not allow hazardous, dangerous or unsanitary conditions to develop or persist on the project site.
- B. **Maintenance:** Operate and maintain temporary services and facilities in good operating condition throughout the time of use and until removal is authorized. Protect from damage by freezing temperatures and similar elements.
- C. **Termination and Removal:** Unless the Architect requests that it be maintained for a longer period of time, remove each temporary service and facility promptly when the need for it or a substantial portion of it has ended, or when it has been replaced by the authorized use of a permanent facility, or no later than substantial completion. Complete, or, if necessary, restore permanent work which may have been delayed because of interference with the temporary service or facility. Repair damaged work, clean exposed surfaces and replace work which cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary services and facilities and remain the property of the Contractor.

END OF SECTION

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SECTION 01 6000

PRODUCT REQUIREMENTS

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 administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. **Related Sections** include the following:
1. Section 01 1900 "**Definitions and Standards**" for applicable industry standards for products specified.
 3. Section 01 7700 "**Closeout Procedures**" for submitting warranties for contract closeout.
 4. **Divisions 2 through 48 Sections** for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. **Products:** Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
1. **Named Products:** Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 2. **New Products:** Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products. Only new products are allowed to be used unless directed by the Architect in writing.
 3. **Comparable Product:** Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. **Substitutions:** Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. **Basis-of-Design Product Specification:** Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

- D. **Manufacturer's Warranty:** Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. **Special Warranty:** Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

- A. **Product List:** Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 - 1. Coordination: Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 - 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 - 3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
 - 4. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - 5. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.
- B. **Substitution Requests:** Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

- c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 business days of receipt of request, or 7 business days of receipt of additional information or documentation, whichever is later.
- a. Form of Acceptance: Change Order.
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

- C. **Basis-of-Design Product Specification Submittal:** Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. **Compatibility of Options:** If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
- 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. **Deliver, store, and handle products** using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 5. Store products to allow for inspection and measurement of quantity or counting of units.
 6. Store materials in a manner that will not endanger Project structure.
 7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 9. Protect stored products from damage.

1.7 PRODUCT WARRANTIES

- A. **General:** Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. **Special Warranties:** Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. **Manufacturer's Standard Form:** Modified to include Project-specific information and properly executed.
 2. Refer to Divisions 2 through 48 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. **Submittal Time:** Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

- A. **General Product Requirements:** Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures: Procedures for product selection include the following:

1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
 - a. Substitutions may be considered, unless otherwise indicated.
2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
5. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
6. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
7. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.
8. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Products" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Substitutions may be considered, unless otherwise indicated.

9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
 - a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. **Timing:** Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
- B. **Conditions:** Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 2. Requested substitution does not require extensive revisions to the Contract Documents.
 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 4. Substitution request is fully documented and properly submitted.
 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
 7. Requested substitution is compatible with other portions of the Work.
 8. Requested substitution has been coordinated with other portions of the Work.
 9. Requested substitution provides specified warranty.
 10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

- A. **Where products** or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION - NOT USED

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SECTION 01 7300

EXECUTION REQUIREMENTS

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** general procedural requirements governing execution of the Work including, but not limited to, the following:
1. Construction layout.
 2. General installation of products.
 4. Progress cleaning.
 5. Starting and adjusting.
 6. Protection of installed construction.
 7. Correction of the Work.
- B. **Related Sections** include the following:
1. Section 01 3100 "**Project Management and Coordination**" for procedures for coordinating field engineering with other construction activities.
 2. Section 01 3300 "**Submittals**" for administrative submittals and also product and procedural submittals.
 3. Section 01 7700 "**Closeout Procedures**" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Existing Conditions:** The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
1. Before construction, verify the location and points of connection of utility services.
- B. **Existing Utilities:** The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

- C. **Acceptance of Conditions:** Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. **Written Report:** Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. **Existing Utility Interruptions:** Do not interrupt utilities serving facilities occupied unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Architect and Owner not less than two business days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Architect's and Owner's written permission.
- B. **Field Measurements:** Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. **Space Requirements:** Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. **Review of Contract Documents and Field Conditions:** Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

- A. **Verification:** Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to existing building. If discrepancies are discovered, notify Architect promptly.

- B. **General:**
1. **Establish benchmarks** and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. **Establish dimensions** within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 3. **Inform installers** of lines and levels to which they must comply.
 4. Check the location, level and plumb, of every major element as the Work progresses.
 5. **Notify Architect** when deviations from required lines and levels exceed allowable tolerances.
- C. **Building Lines and Levels:** Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- D. **Record Log:** Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.5 INSTALLATION

- A. **General:** Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 4. Maintain minimum headroom clearance as indicated in spaces without a suspended ceiling.
- B. **Comply with manufacturer's written instructions** and recommendations for installing products in applications indicated.
- C. **Install products** at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. **Conduct construction operations** so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. **Tools and Equipment:** Do not use tools or equipment that produce harmful noise levels.
- F. **Anchors and Fasteners:** Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
1. **Mounting Heights:** Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.

- G. **Joints:** Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- H. **Hazardous Materials:** Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

- A. **General:** Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 degrees F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. **Site:** Maintain Project site free of waste materials and debris.
- C. **Work Areas:** Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. **Installed Work:** Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. **Concealed Spaces:** Remove debris from concealed spaces before enclosing the space.
- F. **Exposed Surfaces:** Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. **Cutting and Patching:** Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
 - 1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
- H. **Waste Disposal:** Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- I. **Protection:** During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

- J. **Maintenance:** Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure smooth operation without damaging effects.
- K. **Limiting Exposures:** Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 DUST CONTROL

- A. **Provide continuous** (7 days per week, 24 hours per day) **fugitive dust control measures** within the limits of the construction site, related sites and adjacent streets and roads. Dust control shall be provided for, but not be specifically limited to, the stabilization of unpaved roads, haul roads, access roads, spoil sites, borrow and material sources, excavations, embankments, stockpiles, and all other areas which become potential sources of dust as a result of construction activities.
- B. **Maintain compliance with the General Utah Air Pollution Regulations, R446 - Utah Air Conservation Regulations, Section 4.5, Fugitive Emissions, applicable County Air Pollution Control Ordinances, and as directed by the Architect.** Dust control measures shall include but not be limited to the following:
 - 1. Wetting of surfaces with water as appropriate.
 - 2. Minimizing surface disturbances.
- C. **In order to control fugitive dust emissions, apply the following procedures and techniques:**
 - 1. Cover loads of materials, debris and waste materials taken from construction sites as needed to suppress dust during transit.
 - 2. Water down or apply other approved dust control measures to the construction site, haul roads and public access roads as needed to suppress dust.
 - 3. All mud and dirt shall be removed from vehicles prior to entering a paved or graveled area or road. Any mud or dirt that is carried out onto paved or graveled surfaces shall be removed from surfaces immediately and no less than daily.

3.8 STARTING AND ADJUSTING

- A. **Start equipment** and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. **Adjust operating components** for proper operation without binding. Adjust equipment for proper operation.
- C. **Test each piece** of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. **Manufacturer's Field Service:** If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. **Provide final protection** and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

- B. **Comply with manufacturer's written instructions** for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

- A. **Repair or remove** and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 2 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. **Restore permanent facilities** used during construction to their specified condition.
- C. **Remove and replace damaged surfaces** that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. **Repair components** that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. **Remove and replace** chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION



IntermountainSM Healthcare

CONSTRUCTION SAFETY REQUIREMENTS

- I. Outside Contractors and Intermountain Construction Employees performing construction activities on Intermountain Healthcare property shall meet the following requirements. Outside Contractors will meet additional qualifications through the Supply Chain Organization Supplier Credentialing Procedure.
 - a. No work will be performed in any Intermountain Facility without prior approval and coordination with the accountable Facility Engineering Manager or Director.
 - b. Each outside contractor will have a Safety Program that complies with 29 CFR 1926 Subpart C. The Safety Program will be in writing.
 - c. Any chemical brought onto Intermountain Property must meet the following requirements:
 - i. Approved by the facility's Chemical Safety Officer,
 - ii. Accompanied by a current material safety data sheet,
 - iii. Stored in accordance with the chemical manufacturer's safety requirements in the appropriate labeled container.
 - iv. Where the chemical quantity is restricted for Healthcare Occupancies by NFPA 30 or other standards, it is the contractor's responsibility to provide for off-site storage.
 - v. The Contractor is responsible to comply with Intermountain's Hazardous Materials policy.
 - vi. The Contractor is responsible for the removal of all chemicals from Intermountain Property and for proper disposal in accordance with applicable laws and regulations.
 - d. No work will be performed without the completion of an Interim Life Safety and Infection Control Risk Assessment. These risk assessments will cover each phase of the construction project.
 - e. In existing facilities, an Asbestos inspection and any necessary abatement will be conducted prior to any renovation or remodel per the Hazmat policy.
 - f. Where work will cause noise or vibration, an assessment will be made following facility procedures to mitigate potential hazards to patients.
 - g. Above the Ceiling Permits
 - i. The Contractor will follow each facility's procedure for obtaining an above the ceiling work permit.
 - ii. No work will be performed prior to obtaining this permit.
 - h. Hot Work Permits
 - i. The Contractor will obtain a Hot Work Permit from Facilities Engineering prior to performing any hot work.
 - ii. The Contractor will provide a continuous and qualified fire watch for the duration and location specified by the Facility Engineering Director.
 - i. Confined Space Permits
 - i. The contractor will coordinate with the Intermountain Facility Engineering Director to assure that all requirements are met and a permit is completed prior to entering a permit required confined space.

- ii. The Facility Engineering Director will be responsible to assure that the contractor is in compliance with Intermountain's Confined Space Policy.
- j. Control of Airborne Contaminants
 - i. The contractor will control all airborne dusts, mists, fumes, and vapors such that there is no exposure to Intermountain employees, patients, or visitors. This includes the generation of contaminants outside the building.
 - ii. If necessary, work will be conducted after hours to minimize potential exposures to staff, patients, and members of the public.
- k. Personal Protective Equipment.
 - i. PPE for head, eye, face, hand, foot, and respiratory protection is the responsibility of the contractor, and will be provided and worn as necessary for the exposure, except as follows:
 - 1. Hard Hats and Safety Glasses are required to be worn at all times when in the construction area.
 - ii. The action level for fall protection on Intermountain Healthcare property is 6'. This includes work from scaffold.

SECTION 01 7700

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. Project Record Documents.
 3. Operation and maintenance manuals.
 4. Warranties.
 5. Instruction of Owner's personnel.
 6. Final cleaning.
- B. **Related Sections** include the following:
1. Section 01 2900 "**Payment Procedures**" for requirements for Applications for Payment for Substantial and Final Completion.
 2. Section 01 7300 "**Execution Requirements**" for progress cleaning of Project site.
 3. Section 01 7820 "**Operation and Maintenance Data**" for operation and maintenance manual requirements.
 4. **Divisions 2 through 48** Sections for specific closeout and special cleaning requirements for products of 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.
- 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.
- C. **Additional Review Fees:** Should Architect perform more than one additional review, or extend its construction period services more than 15 business days beyond the scheduled completion date, due to the failure of the Contractor's work to comply with the claims of status or completion made by the Contractor, Owner will compensate Architect for such additional/ extended services at the rate of \$500.00 per day. The Owner shall then deduct the amount of such compensation from the final payment to the Contractor.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. **Preparation:** Submit three copies of Contractors list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.

1.6 PROJECT RECORD DOCUMENTS

- A. **General:** Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.
- B. **Record Drawings:** Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
1. 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 cannot be readily identified and recorded 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.
 - d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
 2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 3. Mark important additional information that was either shown schematically or omitted from original Drawings.
 4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
 5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

- C. **Record Specifications:** Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy 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. Note related Change Orders, Record Drawings, and Product Data, where applicable.
- D. **Record Product Data:** Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
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 Drawings, and Record Specifications, where applicable.
- E. **Miscellaneous Record Submittals:** 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.

1.7 OPERATION AND MAINTENANCE MANUALS

- A. **Assemble a complete set of operation and maintenance data** indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
1. Operation Data:
 - a. Emergency instructions and procedures.
 - b. System, subsystem, and equipment descriptions, including operating standards.
 - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
 - d. Description of controls and sequence of operations.
 - e. Piping diagrams.
 2. Maintenance Data:
 - a. Manufacturer's information, including list of spare parts.
 - b. Name, address, and telephone number of Installer or supplier.
 - c. Maintenance procedures.
 - d. Maintenance and service schedules for preventive and routine maintenance.
 - e. Maintenance record forms.
 - f. Sources of spare parts and maintenance materials.
 - g. Copies of maintenance service agreements.
 - h. Copies of warranties and bonds.

- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.8 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. **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.
- C. **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 DEMONSTRATION AND TRAINING

- A. **Instruction:** Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Provide instructors experienced in operation and maintenance procedures.
 - 2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
 - 3. Schedule training with Owner, through Architect, with at least seven days' advance notice.
 - 4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

- B. **Program Structure:** Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
1. System design and operational philosophy.
 2. Review of documentation.
 3. Operations.
 4. Adjustments.
 5. Troubleshooting.
 6. Maintenance.
 7. Repair.

3.2 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. Remove snow and ice to provide safe access to building.
 - f. 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.
 - 1) Use low VOC and low emitting cleaning products to the maximum extent feasible.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. 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.
 - k. Remove labels that are not permanent.

- l. 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.
 - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to unusual operating conditions.
 - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - r. 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.
 - s. Leave Project clean and ready for occupancy.
- C. **Cleaning Standards:** 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.

END OF SECTION

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INTERMOUNTAIN HEALTHCARE

RECORD DRAWING REQUIREMENTS

PROJECT CONTRACT NAME: Project Contract Name

ARCHITECTURAL FIRM: Architect Firm ARCH. PROJECT NO: ##

CONTRACTOR: Contractor

*Record Drawings are required per the Owner / Architect contract agreement and shall consist of AutoCAD files (.dwg), BIM files (i.e. REVIT [.rvt], etc.), PDF (.pdf) files, Sheet Index (.xls), Renderings/Photos and Specifications as outlined below. Drawing files shall be separated into individual files with all external references (xrefs) and attached files (i.e. images, special fonts, pen settings, etc.) bound to each separate drawing. The AutoCAD, BIM and PDF files can be included under each discipline below in separate folders. Naming of these files shall be sequential and as outlined on the Architects Drawing Index. The file names shall not include any special characters and/or symbols (i.e. \, /, :, *, ?, ", <, >, |, #, {, }, %, ~, &, etc.). **By submitting Record Drawings to the Owner, Architect has verified that all content is functional and readable.***

RECORD DRAWING SHEET INDEX Provide an Excel File (.xls) of complete drawing index.

RECORD DRAWING DISCIPLINES	AUTOCAD (.dwg)	REVIT (.rvt)	PDF (.pdf)
ARCHITECTURAL.....	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
CIVIL.....	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LANDSCAPE.....	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
STRUCTURAL.....	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
PLUMBING.....	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
MECHANICAL.....	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ELECTRICAL.....	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
_____.....	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
_____.....	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
_____.....	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
_____.....	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

RECORD SPECIFICATIONS Separate into Divisions / Sections with T.O.C. (.pdf)

RENDERINGS | PHOTOS

REVIEWED BY: Architect DATE REVIEWED: 10/10/2012

SIGNATURE: _____

*This document is to be included in Division I specifications and kept with the Record Drawing file.

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SECTION 01 7820

OPERATION AND MAINTENANCE DATA

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 preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.
- B. **Related Sections** include the following:
 - 1. Section 01 3313 "**Submittal Procedures**" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Section 01 7700 "**Closeout Procedures**" for submitting operation and maintenance manuals.
 - 3. **Divisions 2 through 48** Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. **System:** An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. **Subsystem:** A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. **Initial Submittal:** Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.
- B. **Final Submittal:** Submit 2 of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
 - 1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. **Organization:** Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. **List of Systems and Subsystems:** List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. **List of Equipment:** List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. **Tables of Contents:** Include a table of contents for each emergency, operation, and maintenance manual.
- E. **Identification:** In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

- A. **Organization:** Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. **Title Page:** Enclose title page in transparent plastic sleeve. Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name, address, and telephone number of Contractor.
 - 6. Name and address of Architect.
 - 7. Cross-reference to related systems in other operation and maintenance manuals.

- C. **Table of Contents:** List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. **Manual Contents:** Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.
- E. **Coordinate final O&M manual data and delivery** with Commissioning Agent as required in LEED EA credit 3 "Enhanced Commissioning."

2.3 EMERGENCY MANUALS

- A. **Content:** Organize manual into a separate section for each of the following:
1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- B. **Type of Emergency:** Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Flood.
 3. Gas leak.

4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- C. **Emergency Instructions:** Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. **Emergency Procedures:** Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. **Content:** In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. **Descriptions:** Include the following:
1. Product name and model number.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. **Operating Procedures:** Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.

- D. **Systems and Equipment Controls:** Describe the sequence of operation, and diagram controls as installed.
- E. **Piped Systems:** Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

- A. **Content:** Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. **Source Information:** List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. **Product Information:** Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. **Maintenance Procedures:** Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. **Repair Materials and Sources:** Include lists of materials and local sources of materials and related services.
- F. **Warranties and Bonds:** Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. **Content:** For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. **Source Information:** List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

- C. **Manufacturers' Maintenance Documentation:** Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 1. Standard printed maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.

- D. **Maintenance Procedures:** Include the following information and items that detail essential maintenance procedures:
 1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training videotape, if available.

- E. **Maintenance and Service Schedules:** Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

- F. **Spare Parts List and Source Information:** Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

- G. **Maintenance Service Contracts:** Include copies of maintenance agreements with name and telephone number of service agent.

- H. **Warranties and Bonds:** Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTIpN

3.1 MANUAL PREPARATION

- A. **Operation and Maintenance Documentation Directory:** Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

- B. **Emergency Manual:** Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

- C. **Product Maintenance Manual:** Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

- D. **Operation and Maintenance Manuals:** Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

- E. **Manufacturers' Data:** Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

- F. **Drawings:** Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

- G. **Comply with** Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

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DIVISION 2 – EXISTING CONDITIONS

Section 02 4101
Section 02 4102

Cutting and Patching
Selective Demolition

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SECTION 02 4101

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. The General Contractor is responsible to patch and repair any and all material disturbed during construction, this is to include but not limited to walls, floors, ceilings, asphalt, concrete, lawns and landscaping, roofs, etc.

1.3 DEFINITION

- A. **Cutting:** Removal of existing 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.
 - 1. **Architect's Approval:** Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

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, including but not limited to the following:
 - 1. Primary operational systems and equipment.
 - 2. Fire-protection systems.
 - 3. Communication systems.
 - 4. Electrical wiring systems.

- C. **Miscellaneous Elements:** Do not cut and patch the following 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.
 - 1. 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.
 - 1. If possible, retain original Installer or fabricator to cut and patch exposed Work. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.

- 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 of these Specifications.

- B. **Existing Materials:** Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing 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 existing 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 existing 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 existing 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 Services:** Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services 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 existing 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 existing 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. **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. **Existing Finished Surfaces:** Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. **Concrete/Masonry:** Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. **Mechanical and Electrical Services:** Cut off pipe or conduit 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.
 - 5. **Patching:** 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. Patch masonry with masonry units and grout that match as closely as possible the original. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 - 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.

END OF SECTION

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SECTION 02 4102

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. Section 02 4101 "**Cutting and Patching**" for cutting and patching procedures for selective demolition operations.

1.3 DEFINITIONS

- A. **Deconstruction:** Disassembly of buildings for the purpose of recovering materials
- B. **Demolish:** Completely remove and legally dispose of off-site.
- C. **Existing to Remain or Retain:** Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled
- D. **Protect:** Except as otherwise defined in greater detail, the term "protect" is used to describe the process of shielding from harm existing fixtures, elements or materials.
- E. **Protect and Maintain:** To remove deteriorating corrosion, reapply protective coatings, and install protective measures such as temporary guards; to provide the least degree of intervention.
- F. **Recycle:** Recovery of demolition waste for subsequent processing in preparation for reuse.
- G. **Remove:** To detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- H. **Remove and Salvage:** To detach items from existing construction and deliver them to Owner ready for reuse.
- I. **Remove and Reinstall:** To detach items from existing construction, repair and clean them for reuse, and reinstall them where indicated.

- J. **Salvage:** Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.
- K. **Stabilize:** To apply measures designed to reestablish a weather-resistant enclosure and the structural reinforcement of an item or portion of the building while maintaining the essential form as it exists at present.

1.4 MATERIALS OWNERSHIP

- A. **Historic items, relics, and similar objects** including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

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 items and materials to be salvaged:** Identify procedures for disassembly.
 - 1. Identify materials to be recycled. Identify materials to be salvaged for reuse on site and off site.
- D. **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.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- E. **Inventory:** After selective demolition is complete, submit a list of items that have been removed and salvaged.
- F. **Pre-demolition Photographs or Videotape:** Show existing conditions of adjoining construction and site improvements, including finish surfaces, which might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.
- G. **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. **Regulatory Requirements:** Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. **Standards:** Comply with ANSI A10.6 and NFPA 241.
- D. **Pre-demolition Conference:** Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." 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. Hazardous materials will be removed by Owner before start of the Work.
 - 2. 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.

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. **Utility Interruption:** 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.
- C. **Provide at least 72 hours'** notice to Owner if shutdown of service is required during changeover.

- D. **Utility Requirements:** Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
- E. **Owner will arrange to shut off indicated utilities** when requested by Contractor.
- F. **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.
- G. **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.
- H. **Utility Requirements:** Refer to Mechanical and Electrical 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. **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.
- C. **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. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 3. Cover and protect furniture, furnishings, and equipment that have not been removed.
- D. **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.

- E. **Temporary Partitions:** Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
- F. **Temporary Shoring:** Provide and maintain 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. **Temporary ventilation:** Provide temporary ventilation as follows:
 - 1. Vacuum old carpets prior to removal using a certified Carpet and Rug Institute (CRI) Green Label vacuum cleaner. Vacuum floor immediately after old carpet is removed.
- B. **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.
- C. **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.
- D. **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 Owner's requirements for using and protecting walkways, 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. Transport items to Owner's storage area designated by Owner.
 5. 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. **Concrete:** Neatly core drill openings in existing floor - verify locations of services in suspended slab and below before any cutting.

3.6 PATCHING AND REPAIRS

- A. **General:** Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. **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.
- C. **Finishes:** Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

- D. **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, as noted on Drawings, 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. Skim coat entire wall surface with drywall compound to provide smooth, unblemished substrate for new paint finish.
 3. 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.
 4. Test and inspect patched areas after completion to demonstrate integrity of installation.
- E. **Ceilings:** Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance. Replace damaged ceiling panels with new panels, matching existing.

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

DIVISION 3 - CONCRETE

Section 03 3053

Cast-in-Place Concrete (Limited Applications)

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SECTION 03 3053

CAST-IN-PLACE CONCRETE (LIMITED APPLICATIONS)

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 specifies **cast-in-place concrete**, including reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.3 SUBMITTALS

- A. **General:** In addition to the following, comply with submittal requirements in ACI 301.
- B. **Product Data:** For each type of manufactured material and product indicated.
- C. **Design Mixes:** For each concrete mix.

1.4 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. **Manufacturer Qualifications:** A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. **Source Limitations:** Obtain each type of cement of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- D. **Comply with ACI 301**, "Specification for Structural Concrete," including the following, unless modified by the requirements of the Contract Documents.
 - 1. General requirements, including submittals, quality assurance, acceptance of structure, and protection of in-place concrete.
 - 2. Formwork and form accessories.
 - 3. Steel reinforcement and supports.
 - 4. Concrete mixtures.
 - 5. Handling, placing, and constructing concrete.
 - 6. Lightweight concrete.

PART 2 - PRODUCTS

2.1 FORMWORK

- A. **Furnish formwork and form accessories** according to ACI 301.

2.2 STEEL REINFORCEMENT

- A. **Reinforcing Bars:** ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. **Plain-Steel Wire:** ASTM A 82, as drawn.
- C. **Plain-Steel Welded Wire Fabric:** ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.3 CONCRETE MATERIALS

- A. **Portland Cement:** ASTM C 150, Type I.
- B. **Normal-Weight Aggregate:** ASTM C 33, uniformly graded, not exceeding 1-1/2-inch nominal size.
- C. **Water:** Potable and complying with ASTM C 94.

2.4 ADMIXTURES

- A. **General:** Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures. Do not use admixtures containing calcium chloride.
- B. **Air-Entraining Admixture:** ASTM C 260.
- C. **Water-Reducing Admixture:** ASTM C 494, Type A.

2.5 RELATED MATERIALS

- A. **Fine-Graded Granular Material:** Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a No. 4 (4.75-mm) sieve and 10 to 30 percent passing a No. 100 (0.15-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.
- B. **Joint-Filler Strips:** ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

2.6 CURING MATERIALS

- A. **Evaporation Retarder:** Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. **Absorptive Cover:** AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- C. **Moisture-Retaining Cover:** ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. **Water:** Potable.

- E. **Clear, Waterborne, Membrane-Forming Curing Compound:** ASTM C 309, Type 1, Class B.

2.7 CONCRETE MIXES

- A. **Comply with ACI 301** requirements for concrete mixtures.
- B. **Prepare design mixes**, proportioned according to ACI 301, for normal-weight concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Compressive Strength (28 Days): Minimum 4000 psi.
 - 2. Slump: 4 inches.
 - a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches after adding admixture to plant- or site-verified, 2- to 3-inch slump.
- C. **Add air-entraining admixture** at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 5.5 to 7.5 percent.

2.8 CONCRETE MIXING

- A. **Ready-Mixed Concrete:** Comply with ASTM C 94 and ASTM C 1116.
 - 1. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.
- B. **Project-Site Mixing:** Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of 1 cubic yard or smaller, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixer capacity larger than 1 cubic yard, increase mixing time by 15 seconds for each additional 1 cubic yard.
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, construct, erect, shore, brace, and maintain formwork according to ACI 301.

3.2 STEEL REINFORCEMENT

- A. **Comply with CRSI's "Manual of Standard Practice"** for fabricating, placing, and supporting reinforcement.

3.3 JOINTS

- A. **General:** Construct joints true to line with faces perpendicular to surface plane of concrete.

- B. **Construction Joints:** Locate and install so as not to impair strength or appearance of concrete, at locations indicated or as approved by Architect.
- C. **Isolation Joints:** Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
- D. **Contraction (Control) Joints in Slabs-on-Grade:** Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
 - 1. **Grooved Joints:** Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

3.4 CONCRETE PLACEMENT

- A. **Comply with recommendations in ACI 304R** for measuring, mixing, transporting, and placing concrete.
- B. **Do not add water** to concrete during delivery, at Project site, or during placement.
- C. **Consolidate concrete** with mechanical vibrating equipment.

3.5 FINISHING FORMED SURFACES

- A. **Smooth-Formed Finish:** As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Completely remove fins and other projections.
 - 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete.
 - 2. Do not apply rubbed finish to smooth-formed finish.
- B. **Related Unformed Surfaces:** At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.6 FINISHING UNFORMED SURFACES

- A. **General:** Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. **Screed surfaces** with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on the surface.
 - 1. Do not further disturb surfaces before starting finishing operations.
- C. **Trowel Finish:** Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

3.7 TOLERANCES

- A. **Comply with ACI 117**, "Specifications for Tolerances for Concrete Construction and Materials."

3.8 CONCRETE PROTECTION AND CURING

- A. **General:** Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection, and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. **Evaporation Retarder:** Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. **Begin curing** after finishing concrete, but not before free water has disappeared from concrete surface.
- D. **Curing Methods:** Cure formed and unformed concrete for at least seven days by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. **Moisture Curing:** Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Continuous water-fog spray.
 - b. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. **Curing Compound:** Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 FIELD QUALITY CONTROL

- A. **Testing Agency:** Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Tests will be performed according to ACI 301.
 - 1. **Testing Frequency:** Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cubic yard, but less than 25 cubic yard, plus one set for each additional 50 cubic yard or fraction thereof.

3.10 REPAIRS

- A. **Remove and replace concrete** that does not comply with requirements in this Section.

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DIVISION 5 – METALS

Section 05 5000

Metal Fabrications

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SECTION 05 5000

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:
 - 1. Steel framing and supports for countertops.
 - 2. Steel framing and supports for mechanical and electrical equipment.
 - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
- B. **Related Sections** include the following:
 - 1. Section 06 1053 "**Miscellaneous Rough Carpentry**" for metal framing anchors and other rough hardware.

1.3 SUBMITTALS

- A. **Shop Drawings General:** Detail 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.
 - 1. Provide templates for anchors and bolts specified for installation under other Sections.
- B. **Welding Certificates:** Copies of certificates for welding procedures and personnel.
- C. **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.
- D. **Delegated-Design Submittal:** For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

- A. **Fabricator Qualifications:** A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. **Welding:** Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.2, "Structural Welding Code--Aluminum."
 - 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
 - 4. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 PROJECT CONDITIONS

- A. **Field Measurements General:** Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. **Established Dimensions:** Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.6 COORDINATION

- A. **Coordinate installation of anchorages for metal fabrications.** Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. **Metal Surfaces, General:** For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness. Do not use steel sheet with variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

2.2 FERROUS METALS

- A. **Steel Plates, Shapes, and Bars:** ASTM A 36/A 36M.
- B. **Uncoated Hot-Rolled Steel Sheet:** Commercial quality, complying with ASTM A 569/A569M or structural quality, complying with ASTM A 570, Grade 30, unless another grade is required by design loads.
- C. **Galvanized-Steel Sheet:** ASTM A 653/A 653M, Structural Steel (SS), G60 (Z180) zinc coating.
- D. **Brackets, Flanges, and Anchors:** Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.
- E. **Slotted Channel Framing:** Cold-formed metal channels with flange edges returned toward web and with 9/16-inch- wide slotted holes in webs at 2 inches o.c.
1. **Width of Channels:** 1-5/8 inches.
 2. **Depth of Channels:** 1-5/8 inches.
 3. **Metal and Thickness:** Uncoated steel complying with ASTM A 570, Grade 33; 14 gauge minimum thickness.
 4. **Finish:** Rust-inhibitive, baked-on, acrylic enamel.
- F. **Welding Rods and Bare Electrodes:** Select according to AWS specifications for metal alloy welded.

2.3 PAINT

- A. **Shop Primer for Ferrous Metal:** Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in 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.
 - 1. Refer to Section 09 9123 - Painting for specific primer required on identified steel items.
- B. **Bituminous Paint:** Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FASTENERS

- A. **General:** Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.
- B. **Bolts and Nuts:** Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. **Anchor Bolts:** ASTM F 1554, Grade 36.
- D. **Machine Screws:** ASME B18.6.3.
- E. **Lag Bolts:** ASME B18.2.1.
- F. **Wood Screws:** Flat head, carbon steel, ASME B18.6.1.
- G. **Plain Washers:** Round, carbon steel, ASME B18.22.1
- H. **Lock Washers:** Helical, spring type, carbon steel, ASME B18.21.1.
- I. **Expansion Anchors:** Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four 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.
- J. **Toggle Bolts:** FS FF-B-588, tumble-wing type, class and style as needed.

2.5 FABRICATION, GENERAL

- A. **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.
- B. **Shear and punch** metals cleanly and accurately. Remove burrs.

- C. **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.
- D. **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 no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- E. **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.
- F. **Cut, reinforce, drill, and tap metal fabrications** as indicated to receive finish hardware, screws, and similar items.
- G. **Fabricate joints** that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- H. **Allow for thermal movement** resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.
- I. **Form exposed work true to line** and level with accurate angles and surfaces and straight sharp edges.
- J. **Remove sharp or rough areas** on exposed traffic surfaces.
- K. **Form exposed connections with hairline joints**, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. **General:** Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.
- B. **Fabricate units** from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Fabricate units from slotted channel framing where required for deflection.
 - 2. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches wide by 1/4 inch thick by 8 inches long at 24 inches o.c., unless otherwise indicated.
 - 3. Furnish inserts if units must be installed after concrete is placed.

2.7 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 where possible.
- B. **Provide cutouts, fittings, and anchorages as needed** 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.

2.8 FINISHES, GENERAL

- A. **Comply with NAAMM's** "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. **Finish metal fabrications** after assembly.

2.9 STEEL AND IRON FINISHES

- A. **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. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- B. **Application:** Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with 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 INSTALLATION, GENERAL

- A. **Fastening to In-Place Construction:** Provide anchorage devices and fasteners where necessary for securing 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.
- B. **Cutting, Fitting, and Placement:** Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications 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 surfaces of exterior units that have been hot-dip galvanized after fabrication and are 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 no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- 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.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. **General:** Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

3.3 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 the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF SECTION

DIVISION 6 - WOOD AND PLASTIC

Section 06 1050	Miscellaneous Carpentry
Section 06 4020	Interior Architectural Woodwork

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SECTION 06 1000

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. Framing with dimension lumber.
 2. Framing with engineered wood products.
 3. Solid wood blocking and nailers at locations of wall mounted fixtures.
 - a. Provide 2 rows each at base and upper cabinets and casework.
 4. Wood furring
 5. Plywood backing panels.

1.3 DEFINITIONS

- A. **Rough Carpentry:** Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.
- B. **Exposed Framing:** Dimension lumber not concealed by other construction.
- C. **Lumber grading agencies**, and the abbreviations used to reference them, include the following:
1. NLGA - National Lumber Grades Authority.
 2. WCLIB - West Coast Lumber Inspection Bureau.
 3. WWPA - Western Wood Products Association.

1.4 SUBMITTALS

- A. **Product Data:** For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
 2. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. **Fastener Patterns:** Full-size templates for fasteners in exposed framing.
- C. **Material Certificates:** For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

- D. **Research/Evaluation Reports:** For the following, showing compliance with building code in effect for Project:
1. Wood-preservative-treated wood.
 2. Engineered wood products.
 3. Power-driven fasteners.
 4. Powder-actuated fasteners.
 5. Expansion anchors.
 6. Metal framing anchors.

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

- A. **Keep materials under cover and dry.** Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. **Lumber:** DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 3. 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.
 4. Provide dressed lumber, S4S, unless otherwise indicated.
 5. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.
- B. **Engineered Wood Products:** Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. **Allowable Design Stresses:** Provide engineered wood products with allowable design stresses, as published by manufacturer, which meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. **General:** Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
1. Do not use chemicals containing chromium or arsenic.
 2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- B. **Pressure treat above-ground items** with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
- C. **Pressure treat wood members in contact with ground** or freshwater with waterborne preservatives to a minimum retention of 0.40 lb/cu. ft.

2.3 FIRE-RETARDANT TREATMENT BY PRESSURE PROCESS

- A. **General:** Where fire-retardant-treated wood is indicated, pressure impregnate lumber and plywood with fire-retardant chemicals to comply with AWPA C20 and C27, respectively, for treatment type indicated; identify "fire-retardant-treated wood" with appropriate classification marking of Underwriters Laboratories, Inc., U.S. Testing, Timber Products Inspection, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
1. Current Evaluation/Research Reports: Provide fire-retardant-treated wood for which a current model code evaluation/research report exists that is acceptable to authorities having jurisdiction and that evidences compliance of fire-retardant-treated wood for application indicated.
- B. **Interior Type A:** For interior locations use fire-retardant chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:
1. No reduction takes place in bending strength, stiffness, and fastener holding capacities below values published by manufacturer of chemical formulation that are based on tests by a qualified independent testing laboratory of treated wood products identical to those indicated for this Project under elevated temperature and humidity conditions simulating installed conditions.
 2. No other form of degradation occurs due to acid hydrolysis or other causes related to manufacture and treatment.
 3. No corrosion of metal fasteners results from their contact with treated wood.
- C. **Exterior Type:** Use for exterior locations and where indicated.
- D. **Inspection:** Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

- E. **Products:** Subject to compliance with requirements, provide one of the following:
1. Interior Type A Fire-Retardant-Treated Wood:
 - a. "Dricon" Hickson Corporation.
 - b. "Pyro-Guard" Hoover Treated Wood Products.
 - c. "Flameproof LHC-HTT" Osmose Wood Preserving Co, Inc.
 2. Exterior Type Fire-Retardant-Treated Wood:
 - a. "Exterior Fire-X" Hoover Treated Wood Products.

2.4 DIMENSION LUMBER

- A. **General:** Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.
- B. **Joists, Rafters, and Other Framing Not Listed Above:** Construction or No. 2 grade and any of the following species:
1. Douglas fir-larch; WCLIB or WWPA.
 2. Provide dressed lumber, S4S, unless otherwise indicated.
 3. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.5 MISCELLANEOUS LUMBER

- A. **General:** Provide lumber for support or attachment of other construction, including the following:
1. Rooftop equipment bases and support curbs.
 2. Blocking.
 3. Nailers.
 4. Furring.
 5. Grounds.
- B. **For items of dimension lumber size,** provide Construction, Stud, or No. 2 grade lumber with 15 percent maximum moisture content and any of the following species:
1. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
 2. Western woods; WCLIB or WWPA.
- C. **For concealed boards,** provide lumber with 15 percent maximum moisture content and any of the following species and grades:
1. Hem-fir or Hem-fir (north), Construction or 2 Common grade; NLGA, WCLIB, or WWPA.
 2. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.
- D. **For furring strips** for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

- A. **Telephone and Electrical Equipment Backing Panels:** DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

2.7 FASTENERS

- A. **General:** Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
- B. **All nails, brad, anchors, bolts and other fasteners** shall be non-ferrous type, of sufficient strength to hold components securely. Verify acceptability of any product with Architect and Owner prior to proceeding with the Work.
 - 1. Verify compatibility of any fastener in contact with treated lumber.

2.8 METAL FRAMING ANCHORS

- A. **General:** Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:
 - 1. **Research/Evaluation Reports:** Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.

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 furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. **Do not use materials with defects** that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- C. **Apply field treatment** complying with **AWPA M4** to cut surfaces of preservative-treated lumber and plywood.
- D. **Securely attach rough carpentry work** to substrate by anchoring and fastening as indicated.

3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

- A. **Install where indicated and where required** for screeding or 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. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.
- C. **Provide permanent grounds** of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FRAMING INSTALLATION, GENERAL

- A. **Framing Standard:** Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
- B. **Framing with Engineered Wood Products:** Install engineered wood products to comply with manufacturer's written instructions.
- C. **Do not splice** structural members between supports.

END OF SECTION

SECTION 06 4023

INTERIOR ARCHITECTURAL WOODWORK

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 but is not limited to the following:
 1. Custom millwork.
 2. Laminate-clad cabinets.
 3. Solid-surface material countertops

1.3 DEFINITIONS

- A. **Interior architectural woodwork includes** wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.4 SUBMITTALS

- A. **Product Data:** Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.
- B. **Shop Drawings:** Provide shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 1. Show details full size.
 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other Sections.
- C. **Samples for verification of the following:**
 1. Plastic-laminate-clad panel products, 8 by 10 inches, for each type, color, pattern, and surface finish.
 2. Thermoset decorative-overlay surfaced panel products, 8 by 10 inches, for each type, color, pattern, and surface finish.
 3. Exposed cabinet hardware, one unit for each type and finish.

1.5 QUALITY ASSURANCE

- A. **AWS Quality Standard:** Comply with applicable requirements of Architectural Woodwork Standards (AWS) - 2nd Edition, October 1, 2014, except as otherwise indicated.
- B. **Installer Qualifications:** Arrange for installation of architectural woodwork by a firm which can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this project.

- C. **Measurements:** Before proceeding with fabrication of woodwork required to be fitted to other construction, obtain field measurements and verify dimensions and shop drawing details as required for accurate fit.
- D. **Casework Integrity**
 - 1. All cabinets shall satisfy the AWS Appendix A testing standards: Structural Integrity Test, Concentrated Load Test, Torsion Test, Door Durability Test, Door Impact Test, Door Hinge Test, Drawer Bottom Impact Test, Drawer Support Test, Drawer And Door Pull Test, Drawer Rolling Load Test and Shelf Load Test.
- E. **Testing**
 - 1. The Owner reserves the right to take random sampling of casework components to verify that the materials and construction are as specified. In the event that one such sampling proves to be inferior to that which is specified, the entire installation shall become suspect of being inferior. The supplier shall, at his own expense, replace all components deemed of being inferior, or the supplier shall provide the quality of casework to the satisfaction of the Owner.
- F. **Materials:** Only non-ferrous metals shall be used in casework, including hardware.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. **Protect woodwork during transit,** delivery, storage, and handling to prevent damage, soilage, and deterioration.
- B. **Do not deliver woodwork** until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.7 PROJECT CONDITIONS

- A. **Environmental Limitations:** Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. **Field Measurements:** Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.
 - 2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to guaranteed 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 interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 WOODWORK FABRICATORS

- A. **Fabricators:** Subject to compliance with requirements of Contract Documents, provide interior architectural woodwork by one of the following:
1. Huetter Mill and Cabinet Company.
 2. Granite Mill and Fixture Company.
 3. Swainston Mill.
 4. Johnson Brothers.
 5. Pacific Cabinets, Inc. of Ferdinand, ID.
 6. Fondell Woodwork.
 7. Artistic Mill
 8. Masterpiece Commercial Millwork.
 9. Client's Design.
 10. Other mills may submit for approval no later than 10 days before the date for receipt of bids. Mills need not be members of AWI or WI to receive consideration, however, quality shall conform to levels outlined in these specifications and Associations' reference standards.
- B. **Acceptable Laminate Manufacturers:** Subject to compliance with requirements of Contract Documents, provide products listed below. If not listed, submit as a substitution according to Conditions of the Contract and the requirements of Division 1 Sections.
1. Wilsonart.
- C. **Acceptable Quartz Surface Manufacturers:** Subject to compliance with requirements of Contract Documents, provide products listed below. If not listed, submit as a substitution according to Conditions of the Contract and the requirements of Division 1 Sections.
1. Cambria.

2.2 MATERIALS

- A. **General:** Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:
1. Hardboard: AHA A135.4.
 2. Particleboard: ANSI A208.1, Grade M-2, made with phenol-formaldehyde resins (no urea formaldehyde).
 3. Softwood Plywood: PS 1.
 4. Hardwood Plywood and Face Veneers: HPVA HP-1.
 - a. Select white maple, plain sliced.

- B. **High-Pressure Decorative Laminate:** NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
- C. **Adhesive for Bonding Plastic Laminate:** Contact cement.
- D. **Thermoset Decorative Overlay:** Decorative surface of thermally fused polyester or melamine-impregnated web, bonded to specified substrate and complying with ALA 1992.
 - 1. Substrate: Medium-density particleboard.
- E. **Quartz-Surfacing Material:** Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.
 - 1. Thickness: 3/4 inch.

2.3 MANUFACTURED UNITS

- A. **Cabinets:**
 - 1. Quality Standard: Comply with AWS Section 10, Custom grade, flush overlay design and the following:
 - 2. Vertical Surface High Pressure Plastic Laminate:
 - a. High pressure plastic laminate for exterior surfaces shall be NEMA vertical grade 0.028 inch thickness, satin finish. Colors are to be selected from manufacturer's full color selection, including polished mirror types. Cabinet fronts for each individual cabinet shall be one color only.
 - b. Balancing sheet on inside of doors, drawer fronts and finished ends shall be high pressure plastic laminate cabinet liner matching cabinet interior.
 - 3. Horizontal Surface High Pressure Plastic Laminate: High pressure plastic laminate for countertops and other horizontal surfaces shall be post-forming grade 0.039 inch thickness, satin finish. Colors to be selected from manufacturer's full color selection.
 - 4. Thermo-Fused Melamine to Particle Board:
 - a. Melamine thermo-fused to a 45 pound density, or better particle board substrate. Color shall be almond.
 - b. Almond colored melamine shall be standard for all cabinet interiors whether exposed or semi-exposed.
 - 5. Hardboard:
 - a. Hardboard for dividers shall be 1/4 inch tempered hardboard smooth both sides. Color shall be dark brown.
 - b. Hardboard exposed one side for cabinet backs and drawer bottoms shall be 1/4 inch thick and pre-finished one side to match cabinet interiors.
 - 6. Laminate Grade for Exposed Surfaces: Provide laminate cladding complying with the following requirements for type of surface and grade.
 - a. Horizontal Surfaces Other Than Tops: GP-50 (0.050 inch nominal thickness).
 - b. Postformed Surfaces: PF-42 (0.039 inch nominal thickness).
 - c. Colors: As indicated on Finish Schedule, Sheet A400.

7. Edge-banding:
 - a. Edge-banding for cabinet body parts shall be purified 0.020 inch PVC, applied with hot melt glue by automatic edge-banding equipment. Color shall be as selected by Architect from manufacturers full color range.
 - b. Edge-banding for door and drawer fronts shall be purified 3 mm PVC applied with hot melt glue by automatic edge-banding equipment. Edges and corners shall be rounded with a 3mm radius and scraped free from machining or chatter marks. Color shall be as selected by Architect from manufacturers full color range.

2.4 MISCELLANEOUS MATERIALS

- A. **Adhesives, General:** Adhesives shall not contain urea formaldehyde.
- B. **VOC Limits for Installation Adhesives:** Installation adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Wood Glues: Not more than 30 g/L.
 - b. Multipurpose Construction Adhesives: 70 g/L.
 - c. Contact Adhesive: Not more than 250 g/L.

2.5 CABINET HARDWARE AND ACCESSORY MATERIALS

- A. **General:** Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware."
- B. **Finish Hardware:**
 1. Hinges: Hafele Single Pivot Institutional Hinge Arm, Aximat® 300, Grade 1, opening angle 270 degrees; matte nickel.
 2. Pulls: Berensen "Metro" 128mm CC brushed nickel pull.
 3. Drawer Slides: Sugatsune stainless steel slides, full extension, sized to accommodate drawers.
 4. Adjustable Shelf Supports:
 - a. Adjustable shelves shall be supported on adjustable shelf supports inserted in shelf holes drilled into the case ends or partitions and adjustable on 32mm (1-1/2 inch) centers. Supports to be KV 346 clips, anochrome.
 5. Locks (where indicated on Drawings): Olympus non-magnetic deadbolts. Locks to have a two level keying system, coordinate with Owner for master locks and keying system.
 6. Screws: Reed and Prince square drive screws. Standard wood screws and sheet metal screws are not acceptable.

2.6 INSTALLATION MATERIALS

- A. **Furring, Blocking, Shims, and Hanging Strips:** Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. **All nails, brad, anchors, bolts and other fasteners** shall be of sufficient strength to hold components securely. Verify acceptability of any product with Architect and Owner prior to proceeding with the Work.
 1. Verify compatibility of any fastener in contact with treated lumber.

- C. **Screws:** Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.
- D. **Nails:** Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
- E. **Anchors:** Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal anchors and inserts as required Provide toothed lead expansion bolt devices for drilled-in-place anchors.

2.7 FABRICATION

- A. **General:**
 - 1. **Wood Moisture Content:** Comply with requirements of referenced quality standard for moisture content of lumber at time of fabrication and for relative humidity conditions in the installation areas.
 - 2. **Dimensions and profiles:** Fabricate woodwork to dimensions, profiles, and details indicated with openings and mortises precut, where possible, to receive hardware and other items and work.
 - 3. **Edges:** Ease edges to a 1/16 inch radius, for corners of cabinets and edges of solid wood (lumber) members less than 1 inch in nominal thickness, 1/8 inch radius for edges of rails and similar members over 1 inch in nominal thickness.
 - 4. **Pre-assembly:** Complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 5. **Pre-Cut Openings:** Fabricate architectural woodwork with pre-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutoffs and, where located in countertops and similar exposures seal edges of cutouts with a water-resistant coating.
 - 6. **Door and Drawer Fronts:** Doors, drawer fronts, and false fronts shall be flush overlay. They shall align vertically and horizontally and be on the same plane as one another. Shall be installed free of: warp, twisting, cupping, and/or bowing that cannot be held true; open joints, visible machine marks, cross-sanding, tear-outs, nicks, chips, and/or scratches

2.8 COMPONENT CONSTRUCTION

- A. **Toe Kicks:** Fixed cabinet bases shall be constructed of 3/4 inch exterior grade oriented strand board with 2x fir stringers height as shown on the drawings. Bases shall be leveled and anchored to the floor in continuing lengths to ensure straight and true lines of casework. Rubber, vinyl, or other finished base shall be furnished and installed by others.
- B. **Core Material:**
 - 1. **Particleboard:** Premium grade board of balanced construction with a density of 45 lbs. per cubic foot and moisture content of 8 percent or less. Face screw holding shall be a minimum of 320 lbs. withdrawal.

C. **Case Body:**

1. Ends: Case ends shall be 3/4 inch fused melamine laminated to thermo-fused melamine to core material with phenolic backer on concealed side. Exposed exterior cabinet ends shall be laminated with vertical grade high pressure plastic laminate. Exposed edges shall be edges with 0.020 inch PVC edge-banding. Holes shall be drilled for adjustable shelf supports at 32mm (1-1/4 inch) centers.
2. Cabinet Top and Bottom:
 - a. Base and tall cabinet top and bottom shall be 3/4 inch thick with melamine thermo-fused to core material and phenolic backer sheets on concealed sides when semi-exposed. Provide plastic laminate if exposed to view.
 - b. Wall cabinet top and bottom shall be 3/4 inch thick except as noted below. Melamine thermo-fused to core material when semi-exposed. Provide plastic laminate if exposed to view.
 - 1) Provide bottoms of upper cabinets with a 50 lb per sq ft/ sq cm load capacity.
 - 2) Provide with thickness of 1 inch minimum when made with particleboard core and are 42 inch and over in length.
 - c. All exposed edges shall be banded with 0.020 inch PVC edge-banding.
3. Adjustable Shelves:
 - a. Load is the total applied weight, uniformly dispersed on an individual shelf, not to exceed 200 lbs on any one shelf. Provide, per the AWS standards, the following load capacities:
 - 1) 50 lbs per sq ft/ sq cm for school, hospital, and library or book shelving.
 - 2) 40 lbs per sq ft/ sq cm for all other shelving
 - b. Deflection is the measured distance from a straight line that a shelf will deflect under load.
 - 1) L/144 (the length of the shelf divided by 144) is the industry standard for the maximum acceptable deflection of a shelf, which permits 1/4 inch deflection in a 36 inch shelf.
 - c. Adjustable shelves shall be 3/4 inch thick with melamine thermo-fused to core material on both sides for shelves up to 30 inch in width, and 1 inch thick for shelves over 30 inch in width.
 - d. Adjustable shelves in exposed or semi-exposed millwork shall be 3/4 inch thick with high pressure plastic laminate on exterior surface on both sides for shelves up to 30 inch in width, and 1 inch thick for shelves over 30 inch in width.
 - e. All exposed edges shall be banded with 0.020 inch thick PVC.
 - f. All shelves to be adjustable on 32mm, 1 1/4 inch centers.
4. Cabinet Backs:
 - a. Cabinet backs shall be 1/4 inch thick pre-finished hardboard for use in semi-exposed cabinets. The 1/4 inch is backed up with 4 inch x 3/4 inch hanging cleats on the back side.
 - b. Exposed back shall be 1/2 inch thick with melamine thermo-fused to core material on interior, and high pressure plastic laminate on exterior surface. The 1/2 inch is backed up with 4 inch x 1/2 inch hanging cleats on the back side.
 - c. Cabinet backs shall be dadoed or plowed in into top, bottom and sides, with a minimum shoulder of 3/8 inch, shall be securely nailed or stapled to the case body at a maximum of 4 inch on center.
 - d. Hanging cleats will be mounted on backs for installation purposes, one top and one bottom in wall and base cabinets. Three rails will be used for all tall cabinets.

- D. **Doors and Drawer Fronts:**
1. Plastic Laminate Doors and Drawer Fronts: Plastic laminate doors and drawer fronts shall be 3/4 inch thick for all hinged and sliding doors with vertical grade high pressure plastic laminate exterior face and color cabinet liner on interior face white.
 - a. Core material to be 11/16 inch thick.
- E. **Joinery:**
1. All parts shall be accurately machined and fit for square and true, within a tolerance not to exceed 1/32 inch difference in measurement at top versus bottom, and 1/16 inch diagonally.
 2. Cabinet components shall be doweled into ends using 10 mm hardwood dowels 4 inch on center maximum, securely glued. First dowel to be spaced a maximum of 1-15/16 inch from each edge or end.
 3. Drawer bodies shall be box type construction with detachable drawer fronts. Joints shall be securely fastened with hardwood dowels and glue.

2.9 QUARTZ-SURFACING-MATERIAL COUNTERTOPS

- A. **Quality Standard:** Comply with AWS Section 11 requirements for countertops.
1. Grade: Premium.
- B. **Colors, Patterns, and Finishes:** Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
1. As indicated on Legend-Finish Schedule or, if not indicated, as selected by Architect from manufacturer's full range including colors and patterns from all price ranges.
- C. **Fabricate tops in one piece**, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
1. Fabricate tops with shop-applied edges of materials and configuration indicated.
 2. Fabricate tops with shop-applied backsplashes.
- D. **Drill holes** in countertops for plumbing fittings, grommets, and soap dispensers **in shop**.
- E. **Countertops** less than 12 feet long shall be continuous, with no seams. Seams in lengths beyond 12 feet shall be located by Architect.

PART 3 - EXECUTION

3.1 PREPARATION

- A. **Condition woodwork** to average prevailing humidity conditions in installation areas before installing.
- B. **Before installing architectural woodwork**, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

- A. **Install woodwork plumb**, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches for plumb and level (including tops).
- B. **Scribe and cut woodwork** to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
- C. **Anchor woodwork to anchors** or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.
- D. **Cabinets:** Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
- E. **Tops:** Anchor securely to base units and other support systems as indicated. Calk space between backsplash and wall with specified sealant.
 - 1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c.
- F. **Complete the finishing** work specified in this Section to the extent not completed at shop or before installation of woodwork.

3.3 ADJUSTING AND CLEANING

- A. **Repair damaged and defective woodwork** where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. **Clean, lubricate, and adjust** hardware.
- C. **Clean woodwork** on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

- A. **Provide final protection** and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

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DIVISION 7 - THERMAL AND MOISTURE PROTECTION

Section 07 2100
Section 07 8413
Section 07 8443
Section 07 9200

Building Insulation
Through-Penetration Firestop Systems
Fire-Resistant Firestops and Joint Systems
Joint Sealants

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SECTION 07 2100
BUILDING INSULATION

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. Concealed building insulation.

1.3 SUBMITTALS

- A. **Product Data:** Provide product data for each type of insulation product specified.
- B. **Product Test Reports:** Provide product test reports from and based on tests performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.

1.4 QUALITY ASSURANCE

- A. **Single-Source Responsibility for Insulation Products:** Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.
- B. **Fire-Test-Response Characteristics:** Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
1. Surface-Burning Characteristics: ASTM E 84.
 2. Fire-Resistance Ratings: ASTM E 119.
 3. Combustion Characteristics: ASTM E 136.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. **Protection:** Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

- B. **Protect plastic** insulation as follows:
1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Available Manufacturers:** Subject to compliance with requirements of Contract Documents, manufacturers offering insulation products that may be incorporated in the Work include, but are not limited to, the following:
1. Glass-Fiber Insulation:
 - a. CertainTeed Corporation.
 - b. Knauf Fiber Glass GmbH.
 - c. Owens-Corning Fiberglas Corporation.
 - d. Johns Manville Corporation.

2.2 INSULATING MATERIALS

- A. **General:** Provide insulating materials that comply with requirements and with referenced standards.
- B. **Unfaced Mineral-Fiber Blanket Insulation:** (blankets without membrane facing). Thermal insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type I.
1. Mineral-Fiber Type: Fibers manufactured from glass.
 2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
 3. At 3 5/8 inch steel stud walls provide R-13 blankets, at 6 inch steel stud walls provide R-19 blankets and provide R-38 blankets at soffits, overhangs and roof exterior.

2.3 AUXILIARY INSULATING MATERIALS

- A. **Adhesive for Bonding Insulation:** Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Examine substrates** and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected. The Architect shall examine the installation of the insulation prior to insulation being covered by other work. If insulation is covered prior to Architect's examination, Contractor shall remove other work, at contractor's expense to allow for Architect's examination.

3.2 PREPARATION

- A. **Clean substrates** of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. **Comply with insulation manufacturer's written instructions** applicable to products and application indicated.
- B. **Install insulation** that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.
- C. **Extend insulation** in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. **Apply single layer of insulation** to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION (ABOVE GRADE)

- A. **Apply insulation** units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. **Install mineral-fiber blankets** in cavities formed by framing members according to the following requirements:
 - 1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Insulation is to extend from floor to deck, typical.
- C. **Stuff glass-fiber loose-fill insulation** into miscellaneous voids and cavity spaces. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.5 PROTECTION

- A. **General:** Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

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SECTION 07 8413

THROUGH-PENETRATION FIRESTOP SYSTEMS

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 through-penetration firestop systems** for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items including, but not limited to:
 - 1. Floors.
 - 2. Roofs.
 - 3. Walls and partitions.
 - 4. Smoke barriers.
 - 5. The work of this section shall include, but not be limited to:
 - a. All clips and other restraining devices necessary for holding fire protection material in place.
 - b. Other items necessary for a complete and integral installation thru out the entire perimeter and other penetrations.
- B. **Related Sections** include the following:
 - 1. **Division 23** Sections specifying duct and piping penetrations.
 - 2. **Division 26** Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

- A. **General:** For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
 - 1. Fire-resistance-rated walls including fire walls, fire partitions, fire barriers, and smoke barriers.
 - 2. Fire-resistance-rated horizontal assemblies including floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
- B. **Rated Systems:** Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:
 - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
 - 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - a. Penetrations located outside wall cavities.
 - b. Penetrations located outside fire-resistance-rated shaft enclosures.
 - 3. L-Rated Systems: Where through-penetration firestop systems are indicated in smoke barriers, provide through-penetration firestop systems with L-ratings of not more than 3.0 cfm/sq. ft at both ambient temperatures and 400 degrees F.

- C. **For through-penetration firestop systems exposed to view**, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 - 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. **For through-penetration firestop systems exposed to view**, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

- A. **Product Data:** For each type of product indicated.
- B. **Shop Drawings:** For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
- C. **Through-Penetration Firestop System Schedule:** Indicate locations of each through-penetration firestop system, along with the following information:
 - 1. Types of penetrating items.
 - 2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 - 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
- D. **Qualification Data:** For Installer.
- E. **Product Test Reports:** From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

- A. **Installer Qualifications:** A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. **Installation Responsibility:** Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- C. **Source Limitations:** Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

- D. **Fire-Test-Response Characteristics:** Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
1. **Firestopping tests** are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 2. **Through-penetration firestop systems** are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. 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 the following:
 - 1) UL in its "Fire Resistance Directory."
- E. **Pre-installation 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. Deliver through-penetration firestop system 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 materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. **Environmental Limitations:** Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. **Ventilate through-penetration firestop systems** per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

- D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Available Products:** Subject to compliance with requirements of Contract Documents, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems indicated that are produced by one of the following manufacturers:
1. STI (Specified Technologies, Inc.).
 2. Hilti, Inc.
 3. Nelson Firestop Products.
 4. 3M; Fire Protection Products Division.
 5. Tremco; Sealant/Weatherproofing Division.

2.2 FIRESTOPPING, GENERAL

- A. **Compatibility:** Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. **Accessories:** Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.
- C. **Accessories include,** but are not limited to, the following items:
1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.

2.3 FILL MATERIALS

- A. **General:** Provide through-penetration firestop systems containing the types of fill materials indicated. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
- B. **Cast-in-Place Firestop Devices:** Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

- C. **Latex Sealants:** Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- D. **Firestop Devices:** Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. **Mortars:** Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.
- F. **Pillows/Bags:** Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.
- G. **Silicone Foams:** Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.
- H. **Silicone Sealants:** Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 1. **Grade:** Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping, gunnable sealant, unless indicated firestop system limits use to non-sag grade for both opening conditions.

2.4 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

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 work.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. **Surface Cleaning:** Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.

- B. **Priming:** Prime substrates where recommended in writing by through-penetration firestop system 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 through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

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

3.4 IDENTIFICATION

- A. **Identify through-penetration firestop systems** with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
 - 1. The words "**Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage.**"
 - 2. Contractor's name, address, and phone number.
 - 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Through-penetration firestop system manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. **Inspecting Agency:** Owner will engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. **Where deficiencies are found,** repair or replace through-penetration firestop systems so they comply with requirements.
- C. **Proceed** with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.6 CLEANING AND PROTECTING

- A. **Clean off excess fill materials** adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. **Provide final protection** and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

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SECTION 07 8443

FIRE-RESISTANT FIRESTOPS AND JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section.

1.2 SUMMARY

- A. **Section Includes:**
 - 1. Joints in or between fire-resistance-rated constructions.
 - 2. Joints in smoke barriers
 - 3. Anywhere indicated on Drawings.
- B. **Related Sections**
 - 1. Section 07 8400 "**Through-Penetration Firestop Systems**" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.
 - 2. Section 07 9200 "**Joint Sealants**" for sealants applied to adjoining components.

1.3 DEFINITIONS

- A. **Firestopping:** Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.4 REFERENCES

- A. **Underwriters Laboratories, Inc. (UL)** Fire Resistance Directory, Volume II, updated annually:
 - 1. Joint Systems (XHBN)
 - 2. Perimeter Fire Containment Systems (XH DG)
 - 3. Fire Resistance Ratings (BXRH)
 - 4. Fill, Voids, or Cavity Material (XHHW)
 - 5. Forming Materials (XHKU)
- B. **Omega Point Laboratories** (Intertek ITL Semko):
 - 1. Fire Resistant Joint Systems
- C. **ASTM International**
 - 1. ASTM E 1966, "Standard Test Method for Fire-Resistive Joint Systems"
 - 2. ASTM E 1399, "Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Width of Architectural Joint Systems"
 - 3. ASTM E 84, "Standard Test Method for Surface Burning Characteristics of Building Materials"
 - 4. ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops"
 - 5. ASTM E 2307, "Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus"
- D. **ANSI/UL 2079**, "Tests for Fire Resistance of Building Joint Systems"

- E. **International Firestop Council (IFC)** "Recommended (IFC) Guidelines for Evaluating Firestop Systems Engineering Judgments".
- F. **IBC 2018**, as enforced by the State of Utah.
- G. **NFPA 101 - Life Safety Code**

1.5 QUALITY ASSURANCE

- A. **Installer Qualifications:** Experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
- B. **Manufacturer's direct representative** (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.
- C. **Firestop System installation shall meet requirements of ASTM E 1966 or ANSI/UL 2079 tested and listed assemblies** that provide fire-resistance ratings not less than that of the construction in which the joint occurs.
- D. **Proposed firestop materials and methods** shall conform to applicable governing codes having local jurisdiction.
- E. **Firestop Systems do not reestablish the structural integrity** of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the Structural Engineer prior to penetrating any load bearing assembly.
- F. **For those firestop applications that exist for which no tested and listed system is available through a manufacturer**, an engineering judgment derived from similar tested and listed system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings shall follow requirements set forth by the International Firestop Council.

1.6 SUBMITTALS

- A. **Product Data:** Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of tested and listed firestop systems to be used and manufacturer's installation instructions.
- B. **Manufacturer's engineering judgment identification number and drawing details** when no tested and listed system is available for an application. Engineering judgment shall include both project name and contractor's name who will install firestop system as described in drawing.
- C. **Deferred Submittal:** To be submitted to the Building Code Official for review.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. **Deliver materials undamaged** in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL or OPL label, where applicable.

- B. **Coordinate delivery of materials** with scheduled installation date to allow minimum storage time at job-site.
- C. **Store materials under cover** and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.
- D. **Comply with recommended procedures**, precautions or remedies described in material safety data sheets as applicable.
- E. Do not use damaged or expired materials.

1.8 PROJECT CONDITIONS

- A. **Do not use** materials that contain **flammable solvents**.
- B. **Schedule installation** of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.
- C. **Verify existing conditions** and substrates before starting work. Correct unsatisfactory conditions before proceeding.
- D. **Weather conditions:** Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.
- E. During installation, **provide masking and drop cloths** to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

- A. **Provide firestopping** composed of components that are **compatible** with each other and substrates forming joints under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- B. **Provide components for each fire-resistive joint system** that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.2 ACCEPTABLE MANUFACTURERS

- A. **Basis of Design:** Contract Documents are based on products of manufacturer listed below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in Contract Documents is not changed, as judged by the Architect.
 1. **Manufacturer:** Hilti, Inc.

- B. **Subject to compliance** with joint systems (XHBN) listed in Volume II of the UL Fire Resistance Directory or OPL Listed Products Directory; provide products of one of the following manufacturers:
1. Hilti, Inc., Tulsa (Basis of Design); www.us.hilti.com
 2. Nelson Firestop Products; www.nelsonfirestop.com
 3. 3M; Fire Protection Products Division; www.solutions.3m.com
 4. Tremco; Sealant/Weatherproofing Division; www.tremcosealants.com.
 5. STI; www.stifirestop.com.

2.3 MATERIALS

- A. Sealants for use with **fire-resistance-rated construction joints**:
1. Hilti CP 672 Speed Spray
 2. Hilti CP 601s Elastomeric Firestop Sealant
 3. Hilti CP 606 Flexible Firestop Sealant
 4. Hilti CP 604 Self-leveling Firestop Sealant
- B. Sealants for use as part of a **Perimeter Fire Barrier System** between fire-resistance-rated floors and exterior wall assemblies:
1. Hilti CFS SP WB Firestop Joint Spray
 2. Hilti CP 604 Self-leveling Firestop Sealant
- C. **Pre-formed mineral wool** designed to fit flutes of metal profile deck and gap between top of wall and metal deck profile; use as a backer for spray material.
1. Hilti CP 777 Speed Plugs
 2. Hilti CP 767 Speed Strips

PART 3 - EXECUTION

3.1 PREPARATION

- A. **Verification of Conditions:** Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
1. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
 2. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
 3. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
 4. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. **Regulatory Requirements:** Install firestop materials in accordance with UL Fire Resistance Directory or Omega Point Laboratories Listed Products Directory.
- B. **Manufacturer's Instructions:** Comply with manufacturer's instructions for installation of construction joint materials.
1. Protect materials from damage on surfaces subjected to traffic.

3.3 FIELD QUALITY CONTROL

- A. **Examine sealed joints** to ensure proper installation before concealing or enclosing areas.
- B. **Keep areas of work accessible** until inspection by applicable code authorities and/or independent inspection agency.
- C. **Patch and repair damage** to firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

3.4 ADJUSTING AND CLEANING

- A. **Remove equipment**, materials and debris, leaving area in undamaged, clean condition.
- B. **Clean surfaces** adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

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SECTION 07 9200

JOINT SEALANTS

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** sealants for the following applications, including those specified by reference to this Section:
1. Exterior joints in the following vertical surfaces and non-traffic horizontal surfaces:
 - a. Control and expansion joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints between different materials listed above.
 - d. Perimeter joints between materials listed above and wall penetrations.
 - e. Other joints as indicated.
 2. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls
 - b. Perimeter joints of exterior openings where indicated.
 - c. Control and expansion joints in ceiling and overhead surfaces.
 - d. Tile control and expansion joints.
 - e. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - f. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - g. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - h. Joints between interior partitions and concrete floors.
 - i. Joints between metal deck and walls.
 - j. Other joints as indicated.
 3. Interior joints in the following horizontal traffic surfaces:
 - a. Control and expansion joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - c. Other joints as indicated.
 4. All joints between dissimilar materials.
- B. **Related Sections** include the following:
1. Section 09 2900 "**Gypsum Board**" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
 2. Section 09 5100 "**Acoustical Ceilings**" for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PERFORMANCE REQUIREMENTS

- A. **Provide elastomeric joint sealants** that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. **Product Data:** For each joint-sealant product indicated.
- B. **Samples for Selection:** Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. **Product Certificates:** Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

1.5 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. **Source Limitations:** Obtain each type of joint sealant through one source from a single manufacturer.
- C. **Preconstruction Compatibility and Adhesion Testing:** Submit to joint sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use manufacturers standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - a. Perform tests under environmental conditions replicating those that will exist during installation.
 - 2. Submit not fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
 - 5. Testing will not be required if joint sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- D. **Mockups:** Before installing joint sealants, apply elastomeric sealants as follows to verify color selections and to demonstrate aesthetic effects and qualities of materials and execution:
 - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
 - 2. Provide not less than six and not more than twelve 12 inch long x typical width and depth samples of sealants and caulks for Owner and Architect review. Samples shall be installed at floors, walls, ceiling and other locations selected by Architect.

1.6 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 date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. **Store and handle materials** in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. **Environmental Limitations:** Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside 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 those allowed by joint sealant manufacturer for applications indicated.
- C. **Joint-Substrate Conditions:** Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 WARRANTY

- A. **Special Installer's Warranty:** Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion.
- B. **Special warranties** specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. **Compatibility:** Provide joint sealants, backings, 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. **VOC Content of Interior Sealants:** Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. **Colors of Exposed Joint Sealants:** All colors shall be **custom** as selected by Architect.

2.2 ELASTOMERIC JOINT SEALANTS

- A. **Elastomeric Sealant Standard:** Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.
- B. **Additional Movement Capability:** Where additional movement capability is specified in the Elastomeric Joint-Sealant Schedule, 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 the time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.
- C. **Suitability for Contact with Food:** Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.3 SOLVENT-RELEASE JOINT SEALANTS

- A. **Acrylic-Based Solvent-Release Joint-Sealant Standard:** Comply with ASTM C 1311 for each product of this description indicated in the Solvent-Release Joint-Sealant Schedule at the end of Part 3.
- B. **Butyl-Rubber-Based Solvent-Release Joint-Sealant Standard:** Comply with ASTM C 1085 for each product of this description indicated in the Solvent-Release Joint-Sealant Schedule at the end of Part 3.

2.4 LATEX JOINT SEALANTS

- A. **Latex Sealant Standard:** Comply with ASTM C 834 for each product of this description indicated in the Latex Joint-Sealant Schedule at the end of Part 3.

2.5 ACOUSTICAL JOINT SEALANTS

- A. **Acoustical Sealant for Exposed and Concealed Joints:** For each product of this description indicated in the Acoustical Joint-Sealant Schedule at the end of Part 3, provide manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
 - 1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.6 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. **Cylindrical Sealant Backings:** ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. **Type C:** Closed-cell material with a surface skin.
- D. **Elastomeric Tubing Sealant Backings:** Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 degrees 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.
- E. **Bond-Breaker Tape:** Polyethylene tape or other plastic tape 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.

2.7 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 joint substrates and adjacent nonporous surfaces in any way, 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. All joints of **dissimilar materials** to receive joint sealant.
- B. **Examine joints** to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- C. **Proceed with installation** only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. **Surface Cleaning of Joints:** Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions 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 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. Porous joint surfaces include concrete, masonry or unglazed surfaces of ceramic tile.
 3. Remove laitance and form-release agents from concrete.
 4. Clean 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 to metal, glass, porcelain enamel or glazed surfaces of ceramic tile.
- B. **Joint Priming:** Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. 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 written installation instructions for products and applications indicated, unless 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. **Install sealant backings** of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

- E. **Install bond-breaker tape** behind sealants where sealant backings are not used between sealants and back of joints.

- F. **Install sealants** by proven techniques to comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
 - 4. Seal abutting joint at all dissimilar materials.

- G. **Tooling of Nonsag Sealants:** Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealants from surfaces adjacent to joint.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.
 - 5. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations 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 the Work progresses by methods and with cleaning materials approved in writing 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 and from damage resulting from construction operations or other causes so sealants 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 installations with repaired areas are indistinguishable from the original work.

3.6 ELASTOMERIC JOINT-SEALANT SCHEDULE

- A. **Medium-Modulus Neutral-Curing Silicone Sealant:** Where joint sealants of this type are indicated, provide products complying with the following:
1. Products:
 - a. 795; Dow Corning.
 - b. PSI-631; Polymeric Systems, Inc.
 - c. Masterseal NP 150, MasterBuilders/BASF
 - d. Spectrem 2; Tremco.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 25.
 4. Use Related to Exposure: NT (nontraffic).
 5. Uses Related to Joint Substrates: M (masonry), G (glass), A (aluminum), and, as applicable to joint substrates indicated, O (other).
 - a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick and masonry, ceramic tile, and wood.
 6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
 7. Applications: Exterior and interior joints in vertical surfaces of concrete; between metal and concrete and mortar; perimeter of metal frames in exterior walls; overhead or ceiling joints.
- B. **Mildew-Resistant Silicone Sealant:** Where joint sealants of this type are indicated, provide products formulated with fungicide that are intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes, and that comply with the following:
1. Products:
 - a. 786 Mildew Resistant; Dow Corning.
 - b. Omniplus, Sonneborn.
 - c. Sanitary 1700; GE Silicones.
 - d. Tremsil 600 White; Tremco.
 - e. Masterseal NP 150, MasterBuilders/BASF
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 25.
 4. Use Related to Exposure: NT (nontraffic).
 5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and ceramic tile.
 6. Applications: Interior joints in vertical surfaces of ceramic tile in toilet rooms, and showers.

- C. **Multicomponent Pourable Urethane Sealant:** Where joint sealants of this type are indicated, provide products complying with the following:
1. Products:
 - a. Vulkem 245; Mameco International.
 - b. Elasto-Thane 920 Pourable; Pacific Polymers, Inc.
 - c. Sikaflex - 2c SL; Sika Corporation.
 - d. Masterseal SL 2; MasterBuilders/BASF
 2. Type and Grade: M (multicomponent) and P (pourable).
 3. Class: 25.
 4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
 5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick and masonry, ceramic tile, and wood.
 6. Applications: Traffic joints.
- D. **Single-Component Nonsag Urethane Sealant:** Where joint sealants of this type are indicated, provide products complying with the following:
1. Products:
 - a. Vulkem 921; Mameco International.
 - b. Dynatrol I; Pecora Corporation.
 - c. DyMonic; Tremco.
 - d. Masterseal NP1, MasterBuilders/BASF
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 25
 4. Use Related to Exposure: NT (nontraffic).
 5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick and masonry, ceramic tile, and wood.
 6. Applications: Joints in concrete.

3.7 LATEX JOINT-SEALANT SCHEDULE

- A. **Latex Sealant:** Where joint sealants of this type are indicated, provide products complying with the following:
1. Products:
 - a. AC-20; Pecora Corporation.
 - b. Sonolac; BASF
 - c. Tremflex 834; Tremco.
 2. Applications: Interior joints in field-painted vertical and overhead surfaces at hollow metal door frames, gypsum drywall, and concrete; and all other interior locations not indicated otherwise.

3.8 ACOUSTICAL JOINT-SEALANT SCHEDULE

- A. **Acoustical Sealant for Exposed and Concealed Joints:** Where joint sealants of this type are indicated, provide products complying with the following:
1. Products:
 - a. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corporation.
 - b. SHEETROCK Acoustical Sealant; USG Corp., United States Gypsum Co.
 2. Applications: Use in locations of sound walls and in locations indicated.

3.9 SMOKE AND ACOUSTIC SEALANT

- A. **Smoke and Acoustical Sealant for Joints** between **metal decks and walls** (non-fire rated): Where joint sealants of this type are indicated, provide products complying with the following:
1. Products (where flutes are parallel to the wall):
 - a. CP767 Speed Strips pre-formed mineral wool plugs by Hilti, if required.
 - b. CP 506 Smoke and Acoustic Sealant; Hilti.
 2. Products (where flutes are perpendicular to the wall):
 - a. CP777 Speed Strips pre-formed mineral wool plugs by Hilti. Press into flutes.
 - b. CP 572 Smoke and Acoustic Sealant; Hilti.

END OF SECTION

DIVISION 8 - OPENINGS

Section 08 1113	Hollow Metal Frames
Section 08 1413	Flush Wood Doors
Section 08 3100	Access Doors and Frames
Section 08 4100	Aluminum Entrances and Storefronts
Section 08 4129	Light Duty Glass Partition and Entrance System
Section 08 7100	Door Hardware
Section 08 8000	Glazing

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SECTION 08 1113

HOLLOW METAL 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. Hollow metal door frames.
- B. **Related Sections**
1. Section 08 1416 "**Flush Wood Doors**" for wood doors installed in steel frames.
 2. Section 08 7100 "**Door Hardware**" for door hardware for hollow metal doors.
 3. Section 09 2900 "**Gypsum Board**" for spot grouting frames installed in steel framed gypsum board partitions
 4. Section 09 9123 "**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, fire-resistance rating, temperature-rise ratings, and finishes.
- B. **Shop Drawings:** Include the following:
1. Elevations of each door frame design.
 2. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 3. Locations of reinforcement and preparations for hardware.
 4. Details of each different wall opening condition.
 5. Details of anchorages, joints, field splices, and connections.
 6. Details of accessories.
 7. Details of moldings, removable stops, and glazing.
- D. **Other Action Submittals:**
1. **Schedule:** Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
- 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. **Available Manufacturers:** Subject to compliance with requirements of Contract Documents, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Amweld Building Products, LLC.
 - 2. Ceco Door Products; an Assa Abloy Group company.
 - 3. Curries Company; an Assa Abloy Group company.
 - 4. Pioneer Industries, Inc.
 - 5. Steelcraft; an Allegion company.
 - 6. Republic Doors.
 - 7. Security Metal Products Corp.

2.2 MATERIALS

- A. **Cold-Rolled Steel Sheet:** ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.

- B. **Hot-Rolled Steel Sheet:** ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. **Frame Anchors:** ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) 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.
- D. **Inserts, Bolts, and Fasteners:** Hot-dip galvanized according to ASTM A 153/A 153M.
- E. **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.
- F. **Grout:** ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143.
- G. **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. **Interior Frames:** Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as face welded unless otherwise indicated.
 - 3. Frames for Wood Doors: 16 gauge (0.053-inch-) thick steel sheet.
- D. **Hardware Reinforcement:** Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. **Jamb Anchors:**
 - 1. **Masonry Type:** Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 19 gauge (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 26 gauge (0.177 inch) thick.
 - 2. **Stud-Wall Type:** Designed to engage stud, welded to back of frames; not less than 19 gauge (0.042 inch) thick.
 - 3. **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 19 gauge (0.042 inch) thick, and as follows:
 - 1. **Monolithic Concrete Slabs:** Clip-type anchors, with two holes to receive fasteners.

2.6 STOPS AND MOLDINGS

- A. **Fixed Frame Moldings:** Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

2.7 ACCESSORIES

- A. **Mullions and Transom Bars:** Join to adjacent members by welding or rigid mechanical anchors.
- B. **Ceiling Struts:** Minimum 1/4-inch-thick by 1-inch- wide steel.
- C. **Grout Guards:** Formed from same material as frames, not less than 0.016 inch thick.

2.8 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. **Sidelight Frames:** Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 4. **Grout Guards:** Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 5. **Floor Anchors:** Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - 6. **Jamb Anchors:** Provide number and spacing of anchors as follows:
 - a. **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 (1066 mm) wide and mounted in metal-stud partitions.

- b. Compression Type: Not less than two anchors in each jamb.
 - c. 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.
 - 7. **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.
- E. **Fabricate concealed stiffeners**, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. **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 non-templated, 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 26 Sections.
 - 5. Provide auxiliary hinge reinforcement at all hinge locations on every frame.
- G. **Stops and Moldings:** Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 - 1. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 2. Provide loose stops and moldings on inside of hollow metal work.

2.9 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 non-templated, 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.

END OF SECTION

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SECTION 08 1416
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.
- B. **Related Sections** include the following:
1. Section 08 1116 "**Aluminum Frames**" for door frames.
 2. Section 08 7100 "**Door Hardware**" for hardware on standard swing doors.

1.3 SUBMITTALS

- A. **Product Data:** For each type of door. Include details of core and edge construction, louvers, 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. Dimensions and locations of mortises and holes for hardware.
 2. Dimensions and locations of cutouts.
 3. Undercuts.
 4. Requirements for veneer matching.
 5. Doors to be factory finished and finish requirements.
 6. Fire ratings for fire doors.
- C. **Samples for Selection:** Color charts consisting of actual materials in small sections for the following:
1. Faces of Factory-Finished Doors: Plastic laminate, 6 inches square, for each color, texture, and pattern selected.

1.4 QUALITY ASSURANCE

- A. **Source Limitations:** Obtain flush wood doors through one source from a single manufacturer.
- B. **Coordinate door installation** with RF-magnetic shielding vendor.
- C. **Manufacturer Qualifications:** A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body (as applicable) and is a certified participant in AWI's Quality Certification Program.

- D. **Quality Standard:** Comply with AWI/AWMAC/WI "Architectural Woodwork Standards, Edition 2."
 - 1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. **Comply** with requirements of referenced standard and manufacturer's written instructions.
- B. **Package doors individually** in plastic bags or cardboard cartons.
- C. **Mark each door on top and bottom rail** with opening number used on Shop Drawings. Do not mark tops of doors where visible from above.

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 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. **Basis of Design:** Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
 - 1. Manufacturer: Masonite; Graham/Maiman
- B. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eggers Industries; Architectural Door Division.
 - 2. Masonite; Graham/Maiman.
 - 3. Oshkosh Door Company.
 - 4. VT Industries Inc.
 - 5. Masonite Architectural; Marshfield-Algoma.

2.2 DOOR CONSTRUCTION, GENERAL

- A. **Low-Emitting Materials:** Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.
- B. **Doors for Transparent Finish:**
1. Grade: Premium (Grade AA faces).
 2. Veneer Species and Cut: Select clear walnut, quarter sawn.
 - a. Stain: As selected by Architect from manufacturer's full range of colors.
 - b. Veneer thickness: Manufacturer's standard.
 - c. Finish System: WDMA TR-8/AWS System 9 (UV cured Acrylated Polyester/Urethane).
 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: Provide door faces of compatible color and grain within each separate room or area of building.
 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, made with binder containing no urea-formaldehyde.
- B. **Interior Veneer-Faced Doors:**
1. Core: Particleboard, Grade LD-2.
 2. Construction: Five plies with stiles and rails bonded to core; entire unit abrasive planed before veneering.
 3. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
 4. Provide doors with glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

2.4 FABRICATION

- A. **Fabricate doors** in sizes indicated for Project-site fitting.
1. Comply with clearance requirements of referenced quality standard for fitting.
- B. **Openings:** Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
1. Light Openings: Trim openings with moldings of material and profile indicated.

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.
- C. **Job-Fitted Doors:** Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
 - 1. **Clearances:** Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch) from bottom of door to top of threshold.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 - 3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.

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

SECTION 08 3100

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing 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. Ceiling access doors and frames.
- B. **Related Sections** include the following:
 - 1. Section 08 7100 "**Door Hardware**" for mortise or rim cylinder locks and master keying.
 - 2. Section 23 3300 "**Air Duct Accessories**" for heating and air-conditioning duct access doors..

1.3 SUBMITTALS

- A. **Product Data:** For each type of door and frame indicated. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.
- B. **Shop Drawings:** Show fabrication and installation details of customized doors and frames. Include plans, elevations, sections, details, and attachments to other Work.
- C. **Schedule:** Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.
- D. **Coordination Drawings:** Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:
 - 1. Method of attaching door frames to surrounding construction.
 - 2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

1.4 QUALITY ASSURANCE

- A. **Source Limitations:** Obtain doors and frames through one source from a single manufacturer.
- B. **Size Variations:** Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

- A. **Verification:** Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Available Manufacturers:** Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Manufacturer: Wind-Lock (www.wind-lock.com)
 2. Product: "Stealth Access Panels"

2.2 ACCESS DOORS AND FRAMES

- A. **Flush Access Door and Frames:** Fabricated of glass-fiber reinforced gypsum.
1. Locations: Gypsum board ceilings where lockable access is not required.
 2. Access Panel: 1/8 – 3/16 inch nominal; drop-in style.
 3. Frame: Tapered edges for tape joints.
 4. Size: As indicated on Drawings but not less than 24 x 24 inches clear opening.

2.3 FABRICATION

- A. **General:** Provide access door assemblies manufactured as integral units ready for installation.
- D. **Latching Mechanisms:** Furnish number required to hold doors in flush, smooth plane when closed.
1. For cylinder lock, furnish two keys per lock and key all locks alike.

2.6 FINISHES, GENERAL

- A. **Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products"** for recommendations for applying and designating finishes.
- B. **Field paint** to match adjoining ceiling.

PART 3 - EXECUTION

3.1 PREPARATION

- A. **Advise installers** of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

3.2 INSTALLATION

- A. **Comply with manufacturer's written instructions** for installing access doors and frames and floor doors and frames.
- B. **Set frames accurately** in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. **Install access doors** with trimless frames and floor doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING AND CLEANING

- A. **Adjust doors and hardware** after installation for proper operation.
- B. **Remove and replace doors and frames** that are warped, bowed, or otherwise damaged.

END OF SECTION

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SECTION 08 4100

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This **Section includes** the following types of aluminum entrance and storefront work:
 - 1. Sidelights.
 - 2. Storefront-type framing system.
 - 3. Supplemental components to close space between new frame walls and existing exterior aluminum system.
 - 4. Aluminum trims to cap frame walls at contact points with curtain wall system.
- B. **Related Sections:**
 - 1. Section 07 9200 "**Joint Sealants**" for sealing between storefront system and the substrate.
 - 2. Section 08 7100 "**Finish Hardware**" for aluminum door hardware. Installation of hardware is by aluminum storefront supplier.
 - 3. Section 08 8000 "**Glazing**" glazing requirements for aluminum entrances and storefront,

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. **General:** Provide aluminum entrance and storefront assemblies that comply with performance characteristics specified, as demonstrated by testing the manufacturer's corresponding stock assemblies according to test methods indicated.
- B. **Thermal Movement:** Design the aluminum entrance and storefront framing systems to provide for expansion and contraction of the component materials. Entrance doors shall function normally over the specified temperature range.
 - 1. The system shall be capable of withstanding a metal surface temperature range of 180 degrees F without buckling, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, stress on glass, or other detrimental effects.
 - 2. Structural Performance: Conduct tests for structural performance in accordance with ASTM E 330. At the conclusion of the tests there shall be no glass breakage or permanent damage to fasteners, anchors, hardware or actuating mechanism. Framing members shall have no permanent deformation in excess of 0.2 percent of their clear span.
 - a. Deflection Normal to the Plane of the Wall: Test pressure required to measure deflection of framing members normal to the plane of the wall shall be equivalent to the wind load specified above. Deflection shall not exceed 1/175 of the clear span, when subjected to uniform load deflection test.

- b. Deflection Parallel to the Plane of the Wall: Test pressures required to measure deflection parallel to the plane of the wall shall be equal to 1.5 times the wind pressures specified above. Deflection of any member carrying its full dead load shall not exceed an amount that will reduce glass bite below 75 percent of the design dimension and shall not reduce the edge clearance between the member and the fixed panel, glass or other fixed member above to less than 1/8 inch. The clearance between the member and an operable door or window shall be at least 1/16 inch.

1.4 SUBMITTALS

- A. **Product Data:** Product data for each aluminum entrance and storefront system required, including:
 - 1. Manufacturer's standard details and fabrication methods.
 - 2. Data on finishing, hardware and accessories.
 - 3. Recommendations for maintenance and cleaning of exterior surfaces.
 - 4. Shop Drawings: Shop drawings for each aluminum entrance and storefront system required, including:
 - a. Layout and installation details, including relationship to adjacent work.
 - b. Elevations at 1/4-inch scale.
 - c. Detail sections of typical composite members.
 - d. Anchors and reinforcement.
 - e. Glazing details.
 - 5. Samples for Color Selection: Submit pairs of samples of each specified color and finish on 12-inch-long sections of extrusions or formed shapes. Where normal color variations are anticipated, include 2 or more units in each set of samples indicating extreme limits of color variations.

1.5 QUALITY ASSURANCE

- A. **Installer Qualifications:** Engage an experienced Installer who has completed installations of aluminum storefront and entrances similar in design and extent to those required for the project and whose work has resulted in construction with a record of successful in-service performance.
- B. **Manufacturer's Qualifications:** Provide aluminum entrances and storefront systems produced by a firm experienced in manufacturing systems that are similar to those indicated for this project and that have a record of successful in-service performance.
- C. **Single Source Responsibility:** Obtain aluminum entrance and storefront systems from one source and from a single manufacturer.
- D. **Design Criteria:** The drawings indicate the size, profile, and dimensional requirements of aluminum entrance and storefront work required and are based on the specific types and models indicated. Aluminum entrance and storefront by other manufacturers may be considered, provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver aluminum entrance and storefront components **in the manufacturer's original protective packaging.**

- B. **Store aluminum components** in a clean dry location away from uncured masonry or concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in a manner to permit circulation of air.
 - 1. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage.

1.7 PROJECT CONDITIONS

- A. **Field Measurements:** Check openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the work
 - 1. Where necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit.

1.8 WARRANTY

- A. **Special Assembly Warranty:** Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.
 - 1. Failures include, but are not limited to, the following.
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Failure of operating components to function properly.
 - 2. Warranty Period: 5 years from date of Substantial Completion.
- B. **Special Finish Warranty:** Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
 - 1. Warranty Period: 3 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Basis of Design:** Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
 - 1. Manufacturer: Kawneer North America, an Alcoa Company.
 - 2. Product: 451
- B. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering entrance and storefront systems that may be incorporated in the work include the following:
 - 1. Kawneer North America, an Alcoa Company.
 - 2. Tubelite, Inc., a division of Apogee Enterprises.
 - 3. C.R. Laurence/United States Aluminum Corp.
 - 4. EFCO Corporation, a division of Apogee Enterprises

2.2 MATERIALS

- A. **Aluminum Members:** Alloy and temper recommended by the manufacturer for strength, corrosion resistance, and application of required finish; comply with ASTM B 221 for aluminum extrusions, ASTM B 209 for aluminum sheet or plate, and ASTM B 211 for aluminum bars, rods and wire.
- B. **Carbon Steel:** Carbon steel reinforcement of aluminum framing members shall comply with ASTM A 36 for structural shapes, plates and bars, ASTM A 611 for cold rolled sheet and strip, or ASTM A 570 for hot rolled sheet and strip.
- C. **Glass and Glazing Materials:** Comply with requirements of "Glass and Glazing" section of these specifications.
- D. **Fasteners:** Provide fasteners of aluminum, nonmagnetic stainless steel, zinc plated steel, or other material warranted by the manufacturer to be noncorrosive and compatible with aluminum components, hardware, anchors and other components.
 - 1. **Reinforcement:** Where fasteners screw-anchor into aluminum members less than 0.125 inches thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.
 - 2. **Exposed Fasteners:** Do not use exposed fasteners except for application of hardware. For application of hardware, use Phillips flat-head machine screws that match the finish of member or hardware being fastened.
 - 3. **Concealed Flashing:** 0.0179-inch (26 gage) minimum dead-soft stainless steel, or 0.026-inch-thick minimum extruded aluminum of alloy and type selected by manufacturer for compatibility with other components.
 - 4. **Brackets and Reinforcements:** Provide high-strength aluminum brackets and reinforcements; where use of aluminum is not feasible provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 123.

2.3 COMPONENTS

- A. **Storefront Framing System:** Provide storefront and entrance framing systems fabricated from extruded aluminum members of size and profile indicated. Include subframes and other reinforcing members of the type indicated. Provide for storefront glazed from the exterior on all sides with projecting stops as scheduled. Shop-fabricate and preassemble frame components where possible. Provide storefront frame sections without exposed seams.
 - 1. **Mullion Configurations:** Provide pockets at the inside glazing face to receive resilient elastomeric glazing. Mullions and horizontals shall be one piece. Make provisions to drain moisture accumulation to the exterior.
 - 2. Where new walls intersect existing exterior glazing system and no mullion exists, provide new aluminum frame section to close between wall end cap and glazing, as shown on Drawings. Seal to glazing and to wall end cap.
- B. **Aluminum Trims:**
 - 1. Where interior gypsum board and frame walls intersect storefront system, provide anodized aluminum brake metal wall end cap.
 - 2. Class 1 anodized finish.
 - a. Match color of existing, adjoining aluminum system.
 - 3. Metal gage: 14 gage (0.063 inches).
 - 4. Minimum return: 1 inch

2.4 FABRICATION

- A. **General:** Fabricate aluminum entrance and storefront components to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes and profile requirements are indicated on the drawings. Variable dimensions are indicated, with maximum and minimum dimensions required, to achieve design requirements and coordination with other work.
- B. **Prefabrication:** Complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible before shipment to the Project site. Disassemble components only as necessary for shipment and installation.
 - 1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.
 - 2. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
- C. **Welding:** Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides. Restore mechanical finish.
 - 1. Welding behind finished surfaces shall be performed in such a manner as to minimize distortion and discoloration on the finished surface.
- D. **Reinforcing:** Install reinforcing as required for hardware and as necessary for performance requirements, sag resistance and rigidity.
- E. **Dissimilar Metals:** Separate dissimilar metals with bituminous paint, or a suitable sealant, or a nonabsorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead.
- F. **Continuity:** Maintain accurate relation of planes and angles with hairline fit of contacting members.
- G. **Fasteners:** Conceal fasteners wherever possible.
- H. **Weather stripping:** For exterior doors, provide compression weather stripping against fixed stops. At other edges, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 - 1. At interior doors and other locations without weather stripping, provide neoprene silencers on stops to prevent metal-to-metal contact.

2.5 FINISHES

- A. **General:** Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. **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.
- C. **AA Designations:** Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. **Clear Anodic Finish - AA-M12C22A41 Mechanical Finish:** nonspecular as fabricated; **Chemical Finish:** etched, medium matte; **Anodic Coating:** Architectural Class I clear coating 0.7 mils or thicker, complying with AAMA 607.1.

PART 3 - EXECUTION

A. EXAMINATION

1. Examine substrates and supports, with the Installer present, for compliance with requirements indicated, installation tolerances, and other conditions that affect installation of aluminum entrances and storefronts. Correct unsatisfactory conditions before proceeding with the installation.
 - a. Do not proceed with installation until unsatisfactory conditions are corrected.

B. INSTALLATION

1. Comply with manufacturer's instructions and recommendations for installation.
2. General: Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Install components in proper alignment and relation to established lines and grades indicated. Provide proper support and anchor securely in place.
3. Construction Tolerances: Install aluminum entrance and storefront to comply with the following tolerances:
 - a. Variation from Plane: Do not exceed 1/8 inch in 12 feet of length or 1/4 inch in any total length.
 - b. Offset from Alignment: The maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16 inch.
 - c. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8 inch.
 - d. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch.
4. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
 - a. Zinc or cadmium plate steel anchors and other unexposed fasteners after fabrication.
 - b. Paint dissimilar metals where drainage from them passes over aluminum.
 - c. Paint aluminum surfaces in contact with mortar, concrete or other masonry with alkali resistant coating.
 - d. Paint wood and similar absorptive material in contact with aluminum and exposed to the elements or otherwise subject to wetting, with two coats of aluminum house paint. Seal joints between the materials with sealant.
5. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
6. Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weathertight construction. Comply with requirements of Division 7 for sealants, fillers, and gaskets.
7. Refer to Division 8 Section "Glazing" for installation of glass and other panels indicated to be glazed into doors and framing, and not preglazed by manufacturer.

C. ADJUSTING

1. Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.

D. CLEANING

1. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings.
2. Clean glass surfaces after installation, complying with requirements contained in the "Glass and Glazing" Section for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

E. PROTECTION

1. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION

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SECTION 08 4129

LIGHT DUTY GLASS PARTITION AND ENTRANCE SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. **Section Includes:**
1. Interior glass swing and barn doors.
 2. Glass sidelights and transoms.
 3. Interior glass partitions and storefronts.
- B. **Related Sections:**
1. Section 05 5000 "**Metal Fabrications**" for overhead-steel support for glass partition and entrance systems.
 2. Section 08 8000 "**Glazing**" for glass used at of light duty system.

1.3 ACTION SUBMITTALS

- A. **Product Data:** For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all-glass system.
- B. **Shop Drawings:** For glass partition entrances and storefronts.
1. Include plans, elevations, and sections.
 2. Include details of fittings and glazing, including isometric drawings of rail fittings.
 3. Door hardware locations, mounting heights, and installation requirements.
- C. **Samples for Initial Selection:** For each type of exposed finish indicated.
- D. **Samples for Verification:** For each type of exposed finish indicated, prepared on Samples of size indicated below.
1. Metal Finishes: 6-inch- long sections of rail fittings, accessory fittings, and other items.
 2. Glass: 6 inches square, showing exposed-edge finish.
 3. Door Hardware: For exposed door hardware of each type, in specified finish, full size.
- F. **Fabrication Sample:** Continuous rail fitting at bottom, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
1. Joinery.
 2. Anchorage.
 3. Glazing with butt glazing.

- G. **Door Hardware Schedule:** Prepared by or under supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors sidelights, transoms, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware. Coordinate items furnished by this Section with Division 8 Section "Door Hardware" items.

- H. **Delegated-Design Submittal:** For glass partition systems 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. Provide engineering calculations for anchoring system to demonstrate compliance with IBC seismic and structural requirements for glass partition system, i.e., gasketed frame shall allow deflection without glass breakage prior to activation of fire protection sprinkler system.

1.4 INFORMATIONAL SUBMITTALS

- A. **Qualification Data:** For Installer and testing agency.

- B. **Product Test Reports:** For glass partition systems, for tests performed by a qualified testing agency.

- C. **Field quality-control** reports.

- D. **Sample Warranty:** For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. **Maintenance Data:** For all-glass systems to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. **Installer Qualifications:** Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

- B. **Testing Agency Qualifications:** Qualified according to ASTM E 699 for testing indicated.

- C. **Product Options:** Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 MOCKUPS

- A. **Mockups:** Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical glass partition system as shown on Drawings. Mockup shall include, at minimum, sliding door and sidelight.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PREINSTALLATION MEETINGS

- A. **Preinstallation Conference:** Conduct conference at Project site.

1.9 WARRANTY

- A. **Special Warranty:** Manufacturer and Installer agree to repair or replace components of all-glass systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - b. Failure of operating components.
 2. **Warranty Period: Two years** from date of Substantial Completion

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. **Delegated Design:** Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glass partition and entrance system.
- B. **General Performance:** Comply with performance requirements specified, as determined by testing of all-glass entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- C. **Structural Loads:**
 1. Deflection Limits - deflection normal to glazing plane is limited to lesser of L/720 and 1/4 inch.
- D. **Seismic Performance:** Glass partition entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- E. **System Description:** Partition system shall be fully modular with flat panel surfaces and tight, straight line joints. Partition construction shall permit 2-way, 3-way, and 4-way, corner and angled intersections to be made at any joint location; and shall permit the removal of any panel or door frame unit without disturbing adjacent units. Units of like size shall be completely interchangeable. Installation shall be free of exposed screws, nuts, rivets, or bolts.

2.2 MANUFACTURERS

- A. **Basis of Design:** Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. **Manufacturer:** DIRTT Environmental Solutions Ltd; www.dirtt.net.
 2. **Products:**
 - a. General Framing System: Curvilinear profile system; to match existing.
 - b. Doors: Sliding/barn type and frameless pivot type.

2.3 METAL COMPONENTS

- A. **Fitting Configuration:** Manufacturer's standard.
1. Glass Partitions and Entrances: Floor to ceiling design.
- B. **Rail Fittings:** Extruded aluminum.
1. Flexible PVC trim at ceiling attachment.
 2. Anchors and Fastenings: Concealed.
- D. **Material:** Aluminum: ASTM B 221 (ASTM B 221M), with strength and durability characteristics of not less than Alloy 6063-T5.
1. Color: Clear anodized – match curtain wall and storefront system and existing system.

2.4 GLASS

- A. **Glass:** ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), tested for surface and edge compression per ASTM C 1048 and for impact strength per 16 CFR 1201 for Category II materials.
1. 3/8 inch clear float glass, unless indicated otherwise.

2.5 DOOR HARDWARE

- A. **General:** Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for glass partition and entrance systems indicated. For exposed parts, match metal and finish of rail fittings.
1. Refer to Division 8 Section "Door Hardware" for additional hardware requirements.
- B. **Top and Bottom Pivots:** Center hung; BHMA A156.4, Grade 1; including cases, bottom arms, top walking beam pivots, plates, and accessories required for complete installation.
1. Swing: Single acting.
 - a. Positive Dead Stop: Coordinated with hold-open angle if any, or at angle selected.
 2. Hold Open: As specified in Division 8 Section "Door Hardware".
 3. Opening-Force Requirements:
 - a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion [and not more than 15 lbf to open the door to its minimum required width].
 - b. Accessible Interior Sliding Doors: Not more than 5 lbf to fully open door.

- C. **Push-Pull Set:** Full-length style such that locking mechanism is incorporated into the pull and is not located separately at bottom of door. Coordinate hardware with Section 08 7100 "Door Hardware".
- D. **Single-Door and Active-Leaf Locksets:** As specified in Section 08 7100 "Door Hardware".
 - 1. Deadbolt operated by key outside and incorporated into pull handle. Coordinate hardware with Section 08 7100 "Door Hardware".
- E. **Inactive-Leaf Locksets:** Bottom-fitting or bottom-rail deadbolt.
 - 1. Deadbolt operated by key outside and as specified in Section 08 7100 "Door Hardware".
- F. **Cylinders:** As specified in Section 08 7100 "Door Hardware."

2.6 BUTT-GLAZING SEALANTS

- A. **Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant:** ASTM C 920, Type S, Grade NS, Class 25, for Uses NT, G, and A.
 - 1. Color: As selected by Architect from manufacturer's full range.
- B. **Sealants** used inside the weatherproofing system shall have a VOC content of 250 g/L or less.

2.8 FABRICATION

- A. **Provide holes and cutouts in glass** to receive hardware, fittings, and accessory fittings before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.
 - 1. Fully temper glass using horizontal (roller-hearth) process, and fabricate so that when glass is installed, roll-wave distortion is parallel with bottom edge of door or lite.
- B. **Factory assemble components** and factory install hardware and fittings to greatest extent possible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Examine areas and conditions**, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. **Proceed with installation only after** unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. **Install all-glass systems** and associated components according to manufacturer's written instructions.
- B. **Set units level, plumb, and true to line**, with uniform joints.
- C. **Maintain uniform clearances** between adjacent components.
- D. **Lubricate hardware** and other moving parts according to manufacturer's written instructions.
- E. **Set, seal, and grout floor closer cases and bottom pivots** as required to suit hardware and substrate indicated.
- F. **Install butt-joint sealants** according to manufacturer's instructions and as specified in Section 07 9200 "Joint Sealants".

3.3 ADJUSTING AND CLEANING

- A. **Adjust glass partition and entrance system doors and hardware** to produce smooth operation and tight fit at contact points and weather stripping.
 - 1. For glass entrance doors accessible to people with disabilities, adjust closers to provide a three-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.
- B. **Remove excess sealant and glazing compounds** and dirt from surfaces.

END OF SECTION

SECTION 08 7100

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This **Section includes items known commercially as finish or door hardware** that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. This Section includes the following:
 - 1. Butt Hinges
 - 2. Lock cylinders and keys
 - 3. Lock and latch sets
 - 4. Exit devices
 - 5. Closers
 - 6. Door trim units
- C. **Related Sections:** The following Sections contain requirements that relate to this Section:
 - 1. Section 08 1113 "**Hollow Metal Frames**" for silencers integral with hollow metal frames.
 - 2. Section 08 1416 "**Flush Wood Doors**" for factory prefitting and factory pre-machining of doors for door hardware.
 - 3. Section 08 4100 "**Aluminum Entrances and Storefronts**" for installation of aluminum entrance door hardware.

1.3 SUBMITTALS

- A. **Product Data:** Provide product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- B. **Hardware Schedule:** Provide a hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
 - a. Type, style, function, size, and finish of each hardware item.
 - b. Name and manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
 - e. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for hardware.
 - g. Door and frame sizes and materials.
 - h. Keying information.

- i. Wiring diagrams with theory of operation.
 - j. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.
 - k. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.
 - l. Electrical Coordination: Provide electrified hardware coordination drawings in order to coordinate the hardware with the electrical and security subcontractors.
2. Samples: Provide samples of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule.
 - a. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.
 3. Templates: Provide templates for doors, frames, and other work specified to be factory prepared for the installation of 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.

1.4 QUALITY ASSURANCE

- A. **Manufacturer (Single Source Responsibility):** Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from single manufacturer, although several may be indicated as offering products complying with requirements.
- B. **Supplier Qualifications:** A recognized architectural door finish hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced and full-time Architectural Hardware Consultant (AHC) who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor.
- C. **Fire-Rated Openings:** Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.
- D. **Emergency Exit Devices:** Where emergency exit devices are required on fire-rated doors (with supplementary marking on doors with labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide labels on exit devices indicating "Fire Exit Hardware".

1.5 PRODUCT HANDLING

- A. **Tag each item or package** separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. **Packaging of door hardware is responsibility of supplier.** As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

- C. **Inventory door hardware** jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- D. **Deliver individually packaged door hardware items promptly** to place of installation (shop or Project site).
- E. **Provide secure lock-up for door hardware** delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.6 MAINTENANCE

- 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Catalog numbers used in the Hardware Schedule were taken from the indicated manufacturers and all finish hardware shall be either the hardware specifically described or an equal product approved by the Architect from the manufacturers listed below as "acceptable manufacturers".

	<u>Specified</u>	<u>Acceptable Manufacturers</u>
Butts	Stanley	Ives, McKinney, Bommer, Hager
Locks	Best	No substitutions
Exit Devices	Precision	Von Duprin
Door Closers	Corbin Russwin	LCN, Sargent
Stops	Hager	Ives, Rockwood, Trimco

2.2 SCHEDULED HARDWARE

- A. **Requirements** for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. Products are identified by using hardware designation numbers of the following:
 1. **Manufacturer's Product Designations:** The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is specified under the Article "Manufacturers" in Part 2 for each hardware type, the comparable product of one of the other manufacturers that complies with requirements.
 2. **ANSI/BHMA designations** used elsewhere in this Section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this Section.
 - a. Butts and Hinges: ANSI/BHMA A156.1.
 - b. Bored and Preassembled Locks and Latches: ANSI/BHMA A156.2.
 - c. Exit Devices: ANSI/BHMA A156.3.
 - d. Door Controls - Closers: ANSI/BHMA A156.4.
 - e. Auxiliary Locks and Associated Products: ANSI/BHMA A156.5.
 - f. Architectural Door Trim: ANSI/BHMA A156.6.
 - g. Template Hinge Dimensions: ANSI/BHMA A156.7.
 - h. Door Controls - Overhead Holders: ANSI/BHMA A156.8.
 - i. Interconnected Locks and Latches: ANSI/BHMA A156.12.

- j. Mortise Locks and Latches: ANSI/BHMA A156.13.
- k. Closer Holder Release Devices: ANSI/BHMA A156.15.
- l. Auxiliary Hardware: ANSI/BHMA A156.16.
- m. Self-Closing Hinges and Pivots: ANSI/BHMA A156.17.
- n. Materials and Finishes: ANSI/BHMA A156.18.

2.3 MATERIALS AND FABRICATION

- A. **Manufacturer's Name Plate:** Do not use 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 acceptable to Architect.
- 1. Manufacturer's identification will be permitted on rim of lock cylinders only.
 - 2. **Base Metals:** Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.
 - 3. **Fasteners:** Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
 - a. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
 - b. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.4 HINGES, BUTTS, AND PIVOTS

- A. **Templates:** Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- B. **Screws:** Provide Phillips flat-head screws complying with the following requirements:
- 1. For metal doors and frames install machine screws into drilled and tapped holes.
 - 2. For fire-rated wood doors install #12 x 1-1/4-inch, threaded-to-the-head steel wood screws.
 - 3. Finish screw heads to match surface of hinges or pivots.
 - 4. **Hinge Pins:** Except as otherwise indicated, provide hinge pins as follows:
 - a. Out-Swing Corridor Doors with Locks: Non-removable pins.
 - b. Interior Doors: Non-rising pins.
 - c. Tips: Flat button and matching plug, finished to match leaves, except where hospital tip (HT) indicated.

5. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors 90 inches or less in height. For doors 90+ to 120 inches high, provide four hinges, for heights of 120+ to 150 inches provide five hinges and so on for each 30 inch increment of height.
 - a. Fire-Rated Doors: Not less than 3 hinges per door leaf for doors 86 inches or less in height with same rule for additional hinges.

2.5 LOCK CYLINDERS AND KEYING

- A. **Keying Schedule:** Review the keying system with the Owner and provide the type required (master, grandmaster or great-grandmaster), either new or integrated with Owner's existing system.
- B. **Cylinders:** Equip locks with small format interchangeable core cylinders.
- C. **Metals:** Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.
- D. **Master-keying:** Comply with Owner's instructions for master-keying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
 1. Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE."
 2. Key Material: Provide keys of nickel silver only.
 3. Key Quantity:
 - a. Furnish 3 change keys for each lock.
 - b. 5 master keys for each master system.
 - c. 5 grandmaster keys for each grandmaster system.
 - d. One extra blank for each lock.
 - e. 3 Control Keys.
 - f. 6 Construction master keys.
 4. Deliver keys to Owner's representative.

2.6 KEY CONTROL SYSTEM

- A. **Provide a key control system** including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150 percent of the number of locks required for the Project.
 1. Provide complete cross index system set up by key control manufacturer, and place keys on markers and hooks in the cabinet as determined by the final key schedule.
 2. Provide hinged-panel type cabinet for wall mounting.

2.7 LOCKS, LATCHES, AND BOLTS

- A. **Locks** shall meet these certifications:
 1. Cylindrical Locks: - ANSI A156.2 Series 4000, Grade 1 Strength and Operational requirements. Meets A117.1 Accessibility Codes. Latch bolts shall be steel with minimum 1/2" throw, deadlocking on keyed and exterior functions. 3/4" throw anti-friction latchbolt on pairs of fire doors. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame. Locksets to be tested to exceed 3,000,000 cycles. Lock case shall be steel. Lock shall incorporate one piece spring cage and spindle. Provide 5/8" minimum throw of latch and deadbolt used on pairs of doors. Provide Seven Year Warranty.

2. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.
3. Flush Bolt Heads: Minimum of 1/2" diameter rods of brass, bronze or stainless steel, with minimum 12" long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.
4. Provide dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.

2.8 CLOSERS AND DOOR CONTROL DEVICES

- A. **Size of Units:** Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.
- B. **Closers:** All door closers shall be of one manufacturer to provide for proper installation and servicing after installation. All closers shall be inspected after installation by a factory representative to ensure proper adjustment and operation. Closer shall carry a manufacturer's 10 year warranty for hydraulic units and 2 year warranty for electrical and/or handicap power assist door closers against manufacturing defects and workmanship.

2.9 DOOR TRIM UNITS

- A. **Fasteners:** Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.
- B. **Fabricate protection plates** not more than 1-1/2 inches less than door width on hinge side and not more than 1/2 inch less than door width on pull side by height indicated.

2.10 HARDWARE FINISHES

- A. **Match items to the manufacturer's standard color** and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets).
- B. **Provide finishes that match** those established by BHMA or, if none established, match the Architect's sample.
- C. **Provide quality of finish**, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- D. **Provide protective lacquer coating** on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated.
- E. The designations used in schedules and elsewhere to indicate hardware finishes **are those listed in ANSI/BHMA A156.18**, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.
- F. The designations used in schedules and elsewhere to indicate hardware finishes are the **industry-recognized standard commercial finishes**, except as otherwise noted.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. **Mount hardware units at heights indicated** in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.
 1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
 2. "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute.

3. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."
4. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.
5. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
6. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. **Adjust and check each operating item of hardware** and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
 1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
 2. Clean adjacent surfaces soiled by hardware installation.
 3. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

3.3 HARDWARE SCHEDULE

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

Hinges	Stanley
Locksets	Best
Exit Devices	Precision
Closers	Corbin Russwin
Trim	Hager
Seals	Pemko

HARDWARE GROUP NO. 1 - ELEVATOR LOBBY

For use on door # (s)
401 401A

Each to Have:

<u>QTY</u>	<u>Description</u>	<u>Catalog Number</u>	<u>Finish Mfr</u>	
SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
2 EA	POWER TRANSFER	EPT10	689	VON
1 EA	PANIC HARDWARE	LX-RX-QEL-9827-L-NL-F=LBR-06-499F	626	VON
1 EA	PANIC HARDWARE	RX-QEL-9827-L-DT-F-LBRAFL-06-499F	626	VON
1 SET	CYLINDER(S)	AS DIRECTED BY IHC	626	TBD
1 EA	SURFACE CLOSER	4040XP RW/PA TBWMS	689	LCN
1 EA	AUTOMATIC OPERATOR	SW100 SERIES	628	BSM
2 EA	4.75" ACTUATOR	10PBS1	630	BEA
2 EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2 EA	WALL STOP	WS406/407CCV	630	IVE
1 EA	MEETING STILE GASKET	328 SERIES X 328 SERIES	AA	ZER
1 EA	PERIMETER GASKET	488S PSA SERIES (HEAD AND JAMBS) BK		ZER
1 SET	ACCESS CONTROL EQUIP.	BY DIVISION 28		
1 EA	CARD READER	BY DIVISION 28		
2 EA	DOOR POSITION SWITCH	BY DIVISION 28		
1 SET	REMOTE RELEASE HDWR	BY DIVISION 28		
1 SET	LOW VOLTAGE POWER	BY DIVISION 28		
1 SET	120VAC POWER	BY DIVISION 28		
1 SET	FIRE ALARM CONTACT	BY DIVISION 28		
1 SET	LV WIRE AND TERMINATIONS	BY DIVISION 28		
1 SET	RACEWAY & CONDUIT	BY DIVISION 26		
1 SET	WIRING DIAGRAMS	PER 087100 ARTICLE "SUBMITTALS"		
1 SET	MV WIRE & TERMINATIONS	BY DIVISION 26		

OPERATIONAL DESCRIPTION

DOOR IS NORMALLY CLOSED AND LATCHED TO PREVENT UNAUTHORIZED ENTRANCE. DURING PROGRAMMED OPEN TIMES, LATCHES REMAIN RETRACTED TO ALLOW PUBLIC PUSH/PULL PASSAGE. OTHERWISE, EITHER VALID CREDENTIAL AT READER OR SIGNAL FROM REMOTE RELEASE SYSTEM MOMENTARILY RETRACT LATCHES TO ALLOW AUTHORIZED ENTRANCE. INSIDE PANIC HARDWARE ALWAYS ALLOW IMMEDIATE EGRESS. OUTER ACTUATOR IS DISABLED WHEN DOORS ARE LATCHED AND ENABLED WHEN LATCHES ARE RETRACTED. INNER ACTUATOR IS ALWAYS ENABLED. DEPRESSING ENABLED ACTUATOR RELEASES MAGNETIC LOC (IF SECURE) AND THEN SIGNALS OPERATOR TO OPEN ACTIVE LEAF. ON LOSS OF POWER, FIRE ALARM, OR SPRINKLER FLOW, MAGNETIC LOCK RELEASES TO ALLOW IMMEDIATE PASSAGE IN EITHER DIRECTION.

HARDWARE GROUP NO. 02 – STAIRWAYS

For use on Door #(s):

411 418

Each to Have:

<u>QTY</u>	<u>Description</u>	<u>Catalog Number</u>	<u>Finish Mfr</u>	
1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	POWER TRANSFER	EPT10	689	VON
1 EA	FIRE EXIT HARDWARE	RX-98-L-F-E996-06-FS	626	VON
1 SET	CYLINDER(S)	AS DIRECTED BY IHC	626	TBD
1 EA	SURFACE CLOSER	4040XP RW/PA TBWMS	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1 EA	PERIMETER GASKET	488S PSA SERIES (HEAD AND JAMBS) BK		ZER
1 EA	CARD READER	BY DIVISION 28		
1 SET	ACCESS CONTROL EQUIP.	BY DIVISION 28		
1 EA	DOOR POSITION SWITCH	BY DIVISION 28		
1 SET	FIRE ALARM CONTACT	BY DIVISION 28		
1 SET	LOW VOLTAGE POWER	BY DIVISION 28		
1 SET	WIRING DIAGRAMS	PER 087100 ARTICLE "SUBMITTALS"		
1 SET	LV WIRE & TERMINATIONS	BY DIVISION 28		
1 SET	RACEWAY & CONDUIT	BY DIVISION 26		

CARD READER IS EXISTING

OPERATIONAL DESCRIPTION

DOOR IS NORMALLY CLOSED AND LATCHED. OUTSIDE LEVER IS NORMALLY SECURE TO PREVENT UNAUTHORIZED ENTRANCE. VALID CREDENTIAL AT READER MOEMENTARILY RELEASES OUTSIDE LEVER TO ALLOW AUTHORIZED ENTRANCE. INSIDE PANIC HARDWARE ALWAYS ALLOW IMMEDIATE EGRESS. ON LOSS OF POWER OR SIGNAL FROM FIRE COMMAND CENTER, OUTSIDE LEVER RELEASES TO ALLOW STAIRWELL RE-ENTRY IN ACCORDANCE WITH IBC 1010.1.9.11/403.5.3.

HARDWARE GROUP NO. 03 – ENTRY LOBBY

For use on Door #(s):
402 402a

Each to Have:

<u>QTY</u>	<u>Description</u>	<u>Catalog Number</u>	<u>Finish Mfr</u>	
1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	POWER TRANSFER	EPT10	689	VON
1 EA	SELF-LATCHING BOLT	FB51T/FB61T	630	IVE
1 EA	FSE STOREROOM LOCK	9K3 DEU 15D FSE (CYL PREP AS REQ'D)	626	BES
1 SET	CYLINDER(S)	AS DIRECTED BY IHC	626	TBD
1 EA	COORDINATOR	COR XFL (MB AS REQ'D)	628	IVE
2 EA	SURFACE CLOSER	4040XP RW/PA TBWMS	689	LCN
2 EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2 EA	WALL STOP	WS406/407CCV	630	IVE
2 EA	OVERTLAPPING ASTRAGAL	383 SERIES	AA	ZER
1 EA	PERIMETER GASKET	488S PSA SERIES (HEAD & JAMBS)	BK	ZER
1 EA	CARD READER	BY DIVISION 28		
1 SET	ACCESS CONTROL EQUIP.	BY DIVISION 28		
2 EA	DOOR POSITION SWITCH	BY DIVISION 28		
1 SET	LOW VOLTAGE POWER	BY DIVISION 28		
1 SET	RACEWAY & CONDUIT	BY DIVISION 26		
1 SET	LV WIRE & TERMINATIONS	BY DIVISION 28		
1 SET	WIRING DIAGRAMS	PER 087100 ARTICLE "SUBMITTALS"		

OPERATIONAL DESCRIPTION

DOOR IS NORMALLY CLOSED AND LATCHED. OUTSIDE LEVER IS NORMALLY SECURE TO PREVENT UNAUTHORIZED ENTRANCE. VALID CREDENTIAL AT READER MOMENTARILY RELEASES OUTSIDE LEVER TO ALLOW AUTHORIZED ENTRANCE. INSIDE LEVER ALWAYS ALLOWS EGRESS. ON LOSS OF POWER, OUTSIDE LEVER REMAINS SECURE AND EMERGENCY ENTRANCE BY KEY IN OUTSIDE LEVER.

HARDWARE GROUP NO. 04 – I.T ROOM

For use on Door #(s):
433

Each to Have:

<u>QTY</u>	<u>Description</u>	<u>Catalog Number</u>	<u>Finish</u>	<u>Mfr</u>
1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	STOREROOM LOCK	9K3 D 15D (CYL PREP AS REQ'D)	626	BES
1 SET	CYLINDER(S)	AS DIRECTED BY IHC	626	TBD
1 EA	ELECTRIC STRIKE	6211 FSE 24VDC	630	VON
1 EA	SURFACE CLOSER	4040XP RW/PA TBWMS	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1 EA	WALL STOP	WS406/407CCV	630	IVE
1 EA	PERIMETER GASKET	488S PSA SERIES (HEAD AND JAMBS)	BK	ZER
1 SET	ACCESS CONTROL EQUIP.	BY DIVISION 28		
1 EA	CARD READER	BY DIVISION 28		
1 EA	DOOR POSITION SWITCH	BY DIVISION 28		
1 EA	MOTION SENSOR	BY DIVISION 28		
1 SET	LOW VOLTAGE POWER	BY DIVISION 28		
1 SET	WIRING DIAGRAMS	PER 087100 ARTICLE "SUBMITTALS"		
1 SET	LV WIRE & TERMINATIONS	BY DIVISION 28		
1 SET	RACEWAY & CONDUIT	BY DIVISION 26		

OPERATIONAL DESCRIPTION

DOOR IS NORMALLY CLOSED AND LATCHED. ELECTRIC STRIKE IS NORMALLY SECURE TO PREVENT UNAUTHORIZED ENTRANCE. VALID CREDENTIAL AT READER MOMENTARILY RELEASES ELECTRIC STRIKE TO ALLOW AUTHORIZED ENTRANCE. INSIDE LEVER ALWAYS ALLOWS EGRESS. ON LOSS OF POWER, STRIKE REMAINS SECURE AND EMERGENCY ENTRANCE BY KEY IN OUTSIDE LEVER.

HARDWARE GROUP NO. 05 – ELECTRICAL, MECHANICAL, JANITOR

For use on Door #(s):
412 413 414 417

Each to Have:

<u>QTY</u>	<u>Description</u>	<u>Catalog Number</u>	<u>Finish</u>	<u>Mfr</u>
1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	STOREROOM LOCK	9K3 D 15D (CYL PREP AS REQ'D)	626	BES
1 SET	CYLINDER(S)	AS DIRECTED BY IHC	626	TBD
1 EA	SURFACE CLOSER	4040XP CUSH TBWMS	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3 EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 06 – STORAGE

For use on Door #(s):
434 440

Each to Have:

<u>QTY</u>	<u>Description</u>	<u>Catalog Number</u>	<u>Finish</u>	<u>Mfr</u>
1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	STOREROOM LOCK	9K3 D 15D (CYL PREP AS REQ'D)	626	BES
1 SET	CYLINDER(S)	AS DIRECTED BY IHC	626	TBD
1 EA	SURFACE CLOSER	4040XP RW/PA TBWMS	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3 EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 07 – QUIET ROOMS

For use on Door #(s):
Not Used

HARDWARE GROUP NO. 08 – WELLNESS & PHONE ROOMS

For use on Door #(s):
431 452 453 454 455 456 457 458

Each to Have:

<u>QTY</u>	<u>Description</u>	<u>Catalog Number</u>	<u>Finish</u>	<u>Mfr</u>
1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	OCC. IND. PRIVACY	45H L 15H VIN	626	BES
1 EA	KICK PLATE	8400 10"X 2" LDW B-CS	630	IVE
1 EA	WALL STOP	WS406/407CCV	630	IVE
1 EA	SILENCERS/GASKET	BY FRAME MANUFACTURER		

HARDWARE GROUP NO. 09 – COLLABORATION ROOMS

For use on Door #(s):
421 422 423 424 425 426 428 429 430 432 436 437
439

Each to Have:

<u>QTY</u>	<u>Description</u>	<u>Catalog Number</u>	<u>Finish</u>	<u>Mfr</u>
1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	PASSAGE LATCH	9K3 0N 15D	626	BES
1 EA	WALL STOP	WS406/407CCV	630	IVE
1 SET	SILENCERS/GASKET	BY FRAME MANUFACTURER		

HARDWARE GROUP NO. 10 – RESTROOMS, BREAK ROOM

For use on Door #(s):

415 416 451

Each to Have:

<u>QTY</u>	<u>Description</u>	<u>Catalog Number</u>	<u>Finish</u>	<u>Mfr</u>
1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	PASSAGE LATCH	9K3 0N 15D	626	BES
1 EA	SURFACE CLOSER	4040XP RW/PA TBWMS	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1 EA	WALL STOP	WS406/407CCV	630	IVE
1 SET	SILENCERS/GASKET	BY FRAME MANUFACTURER		

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SECTION 08 8000

GLAZING

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 **glazing** for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Doors.
 - 2. Interior borrowed lites.
 - 3. Glazing film.

1.3 DEFINITIONS

- A. **Manufacturer:** A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.
- B. **Interspace:** Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- C. **Deterioration of Coated Glass:** Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- D. **Deterioration of Insulating Glass:** Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 PERFORMANCE REQUIREMENTS

- A. **General:** Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

- B. **Glass Design:** Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 60 seconds or less.
 - b. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.

1.5 SUBMITTALS

- A. **Product Data:** For each glass product and glazing material indicated.
- B. **Samples:** For the following products, in the form of 12-inch- square Samples for glass and of 12-inch- long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
1. Insulating glass for each designation indicated.
 2. For each color (except black) of exposed glazing sealant indicated.
- C. **Glazing Schedule:** Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. **Product Certificates:** Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- E. **Preconstruction Adhesion and Compatibility Test Report:** From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- F. **Warranties:** Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who has completed glazing similar in material, design and extent to that indicated for this project; whose work has resulted in glass installations with a record of successful in-service performance.
- B. **Source Limitations for Clear Glass:** Obtain clear float glass from one primary-glass manufacturer.
- C. **Source Limitations for Insulating Glass:** Obtain insulating-glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.
- D. **Source Limitations for Glazing Accessories:** Obtain glazing accessories from one source for each product and installation method indicated.
- E. **Glass Product Testing:** Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

- F. **Elastomeric Glazing Sealant Product Testing:** Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
 - 1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 - 2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- G. **Safety Glass:** Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
 - 1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
- H. **Glazing Publications:** Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."
- I. **Mock-Up (Window Glazing Film):** Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.
- J. **Pre-installation Conference:** Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. **Protect glazing materials** according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 WARRANTY

- A. **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.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. **Available Products:** Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in schedules at the end of Part 3.

2.2 PRIMARY FLOAT GLASS

- A. **Float Glass:** ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedules at the end of Part 3.

2.3 HEAT-TREATED FLOAT GLASS

- A. **Fabrication Process:** By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
- B. **Heat-Treated Float Glass:** ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); class, kind, and condition as indicated in schedules at the end of Part 3.

2.4 ELASTOMERIC GLAZING SEALANTS

- A. **General:** Provide products of type indicated, complying with the following requirements:
 - 1. **Compatibility:** Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. **Suitability:** Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. **Colors of Exposed Glazing Sealants:** As selected by Architect from manufacturer's full range for this characteristic.
- B. **Elastomeric Glazing Sealant Standard:** Comply with ASTM C 920 and other requirements indicated for each liquid-applied, chemically curing sealant in the Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.
 - 1. **Additional Movement Capability:** Where additional movement capability is specified in the Glazing Sealant Schedule, 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 in ASTM C 920 for uses indicated.

2.5 GLAZING TAPES

- A. **Back-Bedding Mastic Glazing Tape:** Preformed, butyl-based elastomeric tape with a solids content of 100 percent; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
- B. **Expanded Cellular Glazing Tape:** Closed-cell, PVC foam tape; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 GLAZING GASKETS

- A. **Soft Compression Gaskets:** Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
1. Neoprene.
 2. EPDM.
 3. Silicone.
 4. Thermoplastic polyolefin rubber.
 5. Any material indicated above.

2.7 WINDOW GLAZING FILM

- A. **Acceptable Product:** Subject to compliance with requirements of Contract Documents, provide the following:
1. 3M™ Fasara™ "Fusion Pearl" SH2CSFP, self-adhesive film.
- B. **Characteristics:**
1. Adhesion: Self-adhesive pressure-sensitive.
 2. Opacity: Translucent.
 3. Removability: Removable with low heat or manufacturer's recommended citrus-based remover with scraper.
 4. Finish: Matte.
 5. Thickness: 0.78 microns.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. **General:** Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. **Cleaners, Primers, and Sealers:** Types recommended by sealant or gasket manufacturer.
- C. **Setting Blocks:** Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
- D. **Spacers:** Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. **Edge Blocks:** Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. **Cylindrical Glazing Sealant Backing:** ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.9 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. **Fabricate glass and other glazing products** in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

- B. **Clean-cut or flat-grind vertical edges** of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.
- C. **Grind smooth and polish** exposed glass edges.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Examine framing glazing**, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. **Proceed with installation only after** unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. **Clean glazing channels** and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. **Comply with combined written instructions** of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. **Glazing channel dimensions**, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. **Protect glass edges** from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. **Apply primers** to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. **Install setting blocks** in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. **Do not exceed edge pressures** stipulated by glass manufacturers for installing glass lites.
- G. **Provide spacers** for glass lites where the length plus width is larger than 50 inches as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. **Provide edge blocking** where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. **Set glass lites** in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. **Square cut wedge-shaped gaskets** at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. **Position tapes on fixed stops** so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. **Install tapes continuously**, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. **Place joints in tapes at corners** of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. **Do not remove release paper** from tape until just before each glazing unit is installed.
- F. **Apply heel bead** of elastomeric sealant.
- G. **Center glass lites in openings** on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. **Apply cap bead** of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. **Fabricate compression gaskets** in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. **Insert soft compression gasket** between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. **Center glass lites** in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. **Install gaskets** so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. **Install continuous spacers**, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. **Force sealants into glazing channels** to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. **Tool exposed surfaces** of sealants to provide a substantial wash away from glass.

3.7 WINDOW GLAZING FILM

- A. **Preparation**
 - 1. Clean surfaces thoroughly prior to installation.
 - 2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. **Installation**
 - 1. Install in accordance with manufacturer's instructions.
 - 2. Cut film edges neatly and square at a uniform distance of 1/8 inch to 1/16 inch of window sealant. Use new blade tips after 3 to 4 cuts.
 - 3. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
 - 4. Apply film to glass and lightly spray film with slip solution.
 - 5. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
 - 6. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
 - 7. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.
- C. **Cleaning and Protection**
 - 1. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.
 - 2. Touch-up, repair or replace damaged products before Substantial Completion.
 - 3. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

3.8 PROTECTION AND CLEANING

- A. **Protect glass** from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- B. **Remove and replace glass that is broken**, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- C. **Wash glass** on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.9 MONOLITHIC FLOAT-GLASS SCHEDULE

- A. **Uncoated Clear Float Glass:** Where glass as designated below is indicated, provide Type I (transparent glass, flat), Class 1 (clear) glass lites complying with the following:
1. Uncoated Clear Annealed Float Glass: Annealed or Kind HS (heat strengthened), Condition A (uncoated surfaces) where heat strengthening is required to resist thermal stresses induced by differential shading of individual glass lites and to comply with performance requirements.
 2. Uncoated Clear Heat-Strengthened Float Glass: Kind HS (heat strengthened).
 3. Uncoated Clear Fully Tempered Float Glass: Kind FT (fully tempered). Provide as required and as indicated.

3.10 GLAZING SEALANT SCHEDULE

- A. **Low-Modulus Nonacid-Curing Silicone Glazing Sealant:** Where glazing sealants of this designation are indicated, provide products complying with the following:
1. Products: Available products include the following:
 - a. 790; Dow Corning.
 - b. UltraPruf SCS2300; GE Silicones.
 - c. Spectrem 1; Tremco.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 25.
 4. Additional Movement Capability: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.
 5. Use Related to Exposure: NT (nontraffic).
 6. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
 - a. Use O Glazing Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and wood.

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DIVISION 9 - FINISHES

Section 09 2216	Non-Structural Metal Framing
Section 09 2900	Gypsum Board
Section 09 3013	Ceramic Tile
Section 09 5100	Acoustical Ceilings
Section 09 5426	Panel Grille Suspended Wood Ceiling System
Section 09 6519	Resilient Floor Tile and Accessories
Section 09 6813	Carpet Tile
Section 09 7200	Wall Coverings
Section 09 7219	Acoustic Textile Wall Coverings
Section 09 9123	Painting

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SECTION 09 2216

NON-STRUCTURAL METAL FRAMING

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** non-structural metal framing members for the following applications:
 - 1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
 - 2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).
- B. **Related Sections** include the following:
 - 1. Section 07 2100 "**Building Insulation**" for insulation installed between framing members.

1.3 SUBMITTALS

- A. **Product Data:** For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. **Fire-Test-Response Characteristics:** For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. **STC-Rated Assemblies:** For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-STRUCTURAL METAL FRAMING, GENERAL

- A. **Framing Members, General:** Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

- A. **Tie Wire:** ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 16 gauge (0.0625-inch-) diameter wire, or double strand of 18 gauge (0.0475-inch-) diameter wire.

- B. Hanger Attachments to Concrete:**
1. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers:** ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
- D. Flat Hangers:** Steel sheet, minimum 1 by 3/16 inch by length indicated.
- E. Carrying Channels:** Cold-rolled, commercial-steel sheet with a base-metal thickness of 16 gauge (0.0538 inch) and minimum 1/2-inch- wide flanges.
1. Depth: Minimum 1-1/2 inches.
- F. Furring Channels (Furring Members):**
1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base Metal Thickness: Minimum 22 gauge.
 2. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
 - a. Subject to compliance with requirements of Contract Documents, products which may be incorporated in the Work include but are not limited to:
 - 1) ClarkDietrich Building Systems; RC Deluxe (RCSD) Resilient Channel.
- G. Sound Clips:** Subject to compliance with requirements of Contract Documents, products which may be incorporated in the Work include but are not limited to:
1. RSIC-1; PAC International, Inc.
- H. Grid Suspension System for Ceilings:** ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Available Products: Subject to compliance with requirements of Contract Documents, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation.
 - c. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Steel Studs and Runners:** ASTM C 645.
1. Minimum Base-Metal Thickness: Minimum 20 gauge (0.0296 inch); 33 ksi.
- B. Equivalent Gauge Steel Studs and Runners:** ASTM C 645
1. Minimum Base-Steel Thickness: 0.019 inch; 65 ksi.
- C. Slip-Type Head Joints:**
1. **Deflection Track:** Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Available Products: Subject to compliance with requirements of Contract Documents, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Steel Network Inc. (The); VertiClip SLD/VertiTrack VTD Series.

- 2) ClarkDietrich Building Systems, BlazeFrame or MaxTrak Slotted Deflection Track.
- C. **Flat Strap Backing Plate:** Steel sheet for blocking and bracing in length and width indicated.
 1. Minimum Base-Metal Thickness: Minimum 16 gauge.
 2. Option (at Contractor's discretion): Proprietary fire-retardant wood blocking and bracing; ClarkDietrich Fire-Retardant Treated Wood Blocking Plate, D16F/D24F.
 - D. **Cold-Rolled Channel Bridging:** 16 gauge bare-steel thickness, with minimum 1/2-inch wide flanges.
 1. Depth: Minimum 1-1/2 inches.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 14 gauge, galvanized steel.
 - E. **Hat-Shaped, Rigid Furring Channels:** ASTM C 645.
 1. Minimum Base Metal Thickness: Minimum 20 Gauge.
 2. Depth: 7/8 inch.
 - F. **Resilient Furring Channels:** 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
 1. ClarkDietrich Building Systems; RC Deluxe (RCSD) Resilient Channel
 - G. **Sound Clips:** Subject to compliance with requirements of Contract Documents, products which may be incorporated in the Work include but are not limited to:
 1. RSIC-1; PAC International, Inc.
 - H. **Cold-Rolled Furring Channels:** 16 gauge steel thickness, with minimum 1/2-inch- wide flanges.
 1. Depth: Minimum 3/4 inch.
 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 22 gauge.
 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 16 gauge diameter wire, or double strand of 0.0475-inch- diameter wire.
 - I. **Z-Shaped Furring:** With nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum bare-metal thickness of 25 gauge, and depth required to fit insulation thickness indicated.

2.4 AUXILIARY MATERIALS

- A. **General:** Provide auxiliary materials that comply with referenced installation standards.
 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. **Sill Sealer for Exterior Steel Stud Walls:**
 1. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
 - a. Manufacturer: Protecto Wrap Company.
 - b. Product: Premium Energy Sill Sealer® with manufacturer's recommended primer.
 2. Properties: 3/8 inch closed cell polyethylene foam with self-adhesive waterproofing membrane.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Examine areas and substrates**, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. **Installation Standard:** ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. **Blocking:** Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, cabinets and casework, or similar construction.
- C. **Bracing:** Install bracing at terminations in assemblies.
- D. **Expansion Joints:** Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING SUSPENSION SYSTEMS

- A. **Install suspension system** components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. **Isolate suspension systems** from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. **Suspend hangers from building structure as follows:**
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 5. Do not attach hangers to steel roof deck.

6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. **Fire-Resistance-Rated Assemblies:** Wire tie furring channels to supports.
- E. **Seismic Bracing:** Sway-brace suspension systems with hangers used for support.
- F. **Grid Suspension Systems:** Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. **Installation Tolerances:** Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. **Where studs are installed directly against exterior masonry walls** or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. **Install studs** so flanges within framing system point in same direction.
- C. **Install tracks** (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
1. **Slip-Type Head Joints:** Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. **Door Openings:** Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb or provide 16 gauge studs at door openings, unless otherwise indicated.
 - b. 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 in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. **Other Framed Openings:** Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. **Fire-Resistance-Rated Partitions:** Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 5. **Sound-Rated Partitions:** Install framing to comply with sound-rated assembly indicated.
 6. **Curved Partitions:**
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

D. **Direct Furring:**

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches on center

E. **Z-Furring Members:**

1. Erect insulation (specified in Division 7 Section "Building Insulation") vertically and hold in place with Z-furring members spaced 24 inches on center
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches on center
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

END OF SECTION

SECTION 09 2900

GYPSUM BOARD

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. Interior gypsum board.
 - 2. Glass mat tile backing panels - interior.
 - 3. Mold-resistant paper-faced gypsum board.
 - 4. Aluminum trim.

- B. **Related Sections** include the following:
 - 1. Section 05 4200 "**Cold-Formed Metal Framing**" for load-bearing steel framing that supports gypsum board.
 - 2. Section 07 2100 "**Building Insulation**" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
 - 3. Section 07 8443 "**Fire-Resistive Joint Systems**" for head-of-wall assemblies that incorporate gypsum board.
 - 4. Section 07 9200 "**Joint Sealants**" for acoustical sealants installed in assemblies that incorporate gypsum board.
 - 5. Section 09 2216 "**Non-Structural Metal Framing**" for non-structural framing and suspension systems that support gypsum board.
 - 6. Section 09 9103 "**Painting**" for primers applied to gypsum board surfaces.
 - 7. Section 10 2600 "**Corner Guards**" for structural laminate corner guards, installed as part of gypsum board work.

1.3 SUBMITTALS

- A. **Product Data:** For each type of product indicated.

- B. **Samples:** For the following products:
 - 1. **Trim Accessories:** Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.4 PERFORMANCE REQUIREMENTS

- A. **Fire-Resistance-Rated Assemblies:** For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

- B. **STC-Rated Assemblies:** For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.5 DELIVERY, STORAGE AND HANDLING

- A. **Store materials** inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 FIELD CONDITIONS

- A. **Environmental Limitations:** Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. **Do not install interior products** until installation areas are enclosed and conditioned.
- C. **Do not install panels** that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

- A. **Size:** Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. **General:** Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
 - 1. **Available Manufacturers:** Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum Co.
 - b. CertainTeed Corporation.
 - c. Georgia-Pacific Gypsum LLC.
 - d. National Gypsum Company.
 - e. PABCO Gypsum.
 - f. USG Corporation.

- B. **Mold-Resistant** Paper-Faced Products
1. Mold Resistance: Score of 10, when tested in accordance with ASTM D 3273
 2. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum; M-Bloc.
 - b. CertainTeed Corporation; ProRoc Brand Moisture & Mold Resistant Gypsum Board.
 - c. Lafarge North America Inc; Mold Defense Drywall.
 - d. National Gypsum Company; Gold Bond Brand XP Gypsum Board.
 - e. Pacific Coast Building Products, Inc; PABCO Mold Curb Gypsum Wallboard.
 - f. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.
- C. **Type X** (for general use, unless noted otherwise):
1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.

2.3 TILE BACKING PANELS

- A. **Glass-Mat**, Water-Resistant Backer Units - interior:
1. Comply with ASTM C 1178/C 1178M.
 2. Available Manufacturers: Subject to compliance with requirements, available manufacturers include but are not limited to:
 - a. "DensShield Tile Guard" by G-P Gypsum.
 - b. "Fiberock Aqua-Tough Interior Panel" by USG Corporation.
 3. Core: 5/8 inch, Type X.
 4. Provide glass-mat, water-resistant backing board wherever tile is applied to a stud wall.

2.4 TRIM ACCESSORIES

- A. **Interior Trim:** ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
 3. Material: Vinyl conforming to ASTM D-1784.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) AMICO (Alabama Metal Industries Corporation), a Gibraltar Industries Company; www.amico-lath.com
 4. Shapes:
 - a. Zip Strip Bead.

- B. **Aluminum Trim:** Extruded accessories of profiles and dimensions indicated.
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:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.5 JOINT TREATMENT MATERIALS

- A. **General:** Comply with ASTM C 475/C 475M.
- B. **Joint Tape:**
1. Interior Gypsum Wallboard: Paper.
 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 3. Tile Backing Panels: As recommended by panel manufacturer.
- C. **Joint Compound for Interior Gypsum Wallboard:** For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
- D. **Joint Compound for Tile Backing Panels:**
1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.6 AUXILIARY MATERIALS

- A. **General:** Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. **Laminating Adhesive:** Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. **Steel Drill Screws:** ASTM C 1002, unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. **Acoustical Sealant:** As specified in **Division 7 Section "Joint Sealants."**

- E. **Thermal Insulation:** As specified in **Division 7** Section "**Building Insulation.**"
- F. **Vapor Retarder:** As specified in **Division 7** Section "**Building Insulation.**"

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Examine areas and substrates,** with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. **Examine panels before installation.** Reject panels that are wet, moisture damaged, and mold damaged.
- C. **Proceed with installation** only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. **Waste Management:** As specified in Division 1 Section "Construction Waste Management and Disposal" and as follows:
 - 1. Select panel sizes and layout panels to minimize waste; reuse cutoffs to the greatest extent possible
- B. **Comply with ASTM C 840.**
- C. **Install ceiling panels** across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. **Install panels with face side out.** 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.
- E. **Locate edge** and 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. Do not make joints other than control joints at corners of framed openings.
- F. **Form control and expansion joints** with space between edges of adjoining gypsum panels.
- G. **Cover both faces** of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless 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 structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

- H. **Isolate perimeter** of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- I. **Attachment to Steel Framing:** Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- J. **STC-Rated Assemblies:** Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. **Install sound attenuation blankets** before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. **Install interior gypsum board** in the following locations:
 - 1. Type X: Vertical surfaces, unless otherwise indicated.
- B. **Single-Layer Application:**
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. **Multilayer Application:**
 - 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.
- D. **Laminating to Substrate:** Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- E. **Curved Surfaces:**
1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
 2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 APPLYING TILE BACKING PANELS

- A. **Glass-Mat, Water-Resistant Backing Panels:** Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- B. **Where tile backing panels abut other types of panels** in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. **General:** For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. **All exposed panel edges**, regardless of location, shall be trimmed and finished.
- C. **Control Joints:** Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- D. **Interior Trim:** Install in the following locations:
1. Cornerbead: Use at outside corners, unless otherwise indicated.
 2. Bullnose Bead: Use where indicated.
 3. LC-Bead: Use at exposed panel edges.
 4. L-Bead: Use where indicated.
 5. U-Bead: Use at exposed panel edges.
 6. Curved-Edge Cornerbead: Use at curved openings.
- E. **Aluminum Trim:** Install in locations indicated on Drawings.

- F. **Install corner beads** at external corners. Provide metal trim to protect edge of gypsum board wherever gypsum board intersects a dissimilar material. Hold channel and L trim back from metal window and door frames 1/8 inch to allow for caulking.

3.6 FINISHING GYPSUM BOARD

- A. **General:** Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. **Prefill open joints**, rounded or beveled edges, and damaged surface areas.
- C. **Apply joint tape** over gypsum board joints, except those with trim having flanges not intended for tape.
- D. **Gypsum Board Finish Levels:** Finish panels to levels indicated below:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile and panels that are substrate for CMU wainscot.
 - 3. Level 3: Panels that are substrates for wall coverings and wall panels.
 - 4. Level 5: At panel surfaces that will be exposed to view, unless otherwise indicated below.
 - a. Primer and its application to surfaces are specified in other Division 9 Sections.
- E. **Glass-Mat, Water-Resistant Backing Panels:** Finish according to manufacturer's written instructions.

3.7 PROTECTION

- A. **Protect adjacent surfaces** from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. **Protect installed products** from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. **Remove and replace** panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.8 FIELD QUALITY CONTROL

- A. **Above-Ceiling Observation:** Architect will conduct an above-ceiling observation before installing gypsum board ceilings and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
 2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air-duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control-air tubing.
 - f. Installation of ceiling support framing.

END OF SECTION

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SECTION 09 3013

CERAMIC 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. Porcelain floor and wall tile.
 - 2. Waterproofing for tile installations
 - 3. Thresholds installed as part of tile installations.
- B. **Related Sections** include the following:
 - 1. Section 03 3300 "**Cast-in-Place Concrete**" for monolithic slab finishes specified for tile substrates.
 - 2. Section 07 9200 "**Joint Sealants**" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 3. Section 09 2900 "**Gypsum Board**" for gypsum backer at ceramic tile installations.

1.3 DEFINITIONS

- A. **Module Size:** Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- B. **Facial Dimension:** Nominal tile size as defined in ANSI A137.1.

1.4 PERFORMANCE REQUIREMENTS

- A. **Static Coefficient of Friction:** For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum 0.6.
- B. **Load-Bearing Performance:** For ceramic tile installed on walkway surfaces, provide installations rated for the following load-bearing performance level based on testing assemblies according to ASTM C 627 that are representative of those indicated for this Project:
 - 1. Heavy: Passes cycles 1 through 12.

1.5 SUBMITTALS

- A. **Product Data:** For each type of tile, mortar, grout, and other products specified.

- B. **Tile Samples for Selection:** Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving color selection.
- C. **Grout Samples for Selection:** Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.

1.6 QUALITY ASSURANCE

- A. **Installer Qualifications:** Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. **Source Limitations for Tile:** Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.
- C. **Source Limitations for Setting and Grouting Materials:** Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- D. **Source Limitations for Other Products:** Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:
 - 1. Solid Surface Material thresholds.
 - 2. Waterproofing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. **Deliver and store** packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. **Prevent damage** or contamination to materials by water, freezing, foreign matter, and other causes.
- C. **Handle tile** with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

- A. **Environmental Limitations:** Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

- A. **Deliver extra materials to Owner.** Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. **Tile and Trim Units:** Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements of Contract Documents, use products by manufacturers listed below. If not listed, submit as a substitution according to the Conditions of the Contract and the provisions of Division 1 Sections.
1. Tile Products:
 - a. Daltile.
 2. Tile-Setting and -Grouting Materials:
 - a. Laticrete International, Inc.
 - b. Mapei Corporation.
 - c. Custom Building Products
 - d. Bostik, an Arkema company.

2.2 PRODUCTS, GENERAL

- A. **ANSI Ceramic Tile Standard:** Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
 2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- B. **ANSI Standards for Tile Installation Materials:** Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.
- C. **Colors, Textures, and Patterns:** Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
1. Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated. Also see the Finish Schedule.
 2. Provide tile trim and accessories that match color and finish of adjoining flat tile.
- D. **Factory Blending:** For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.
- E. **Mounting:** Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.
1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for these kinds of installations and has a record of successful in-service performance.
- F. **Factory-Applied Temporary Protective Coating:** Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating them with a continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 TILE PRODUCTS

- A. **Porcelain Ceramic Tile (F3):**
1. Composition: Colored body porcelain with stone look
 2. Module Size: 24 x 48 inches.
 3. Thickness: 3/8 inch.
 4. Finish: Unpolished.
 5. Colors: As listed in the Legend-Finish Schedule
- B. **Porcelain Ceramic Mosaic Tile (W2).**
1. Composition: Glazed colored body porcelain
 2. Module Size: 12 x 12 inch.
 3. Thickness: 5/16 inch
 4. Finish: Matte.
 5. Colors: As listed in the Legend-Finish Schedule.
- C. **Mosaic Wall Tile (W3):** Factory mounted sheets
1. Composition: Limestone.
 2. Finish: Polished.
 3. Module Size: "Modern" pattern, random mosaic.
 4. Colors: As listed in the Key-Finish Schedule.
- D. **Glazed Ceramic Wall Tile (W4)**
1. Composition: Glazed ceramic; gloss.
 2. Module Size: 9 x12 inches.
 3. Thickness: 1/4 inch.
 4. Colors: As listed in the Legend-Finish.
- E. **Glazed Ceramic Wall Tile (W5)**
1. Composition: Glazed ceramic; gloss.
 2. Module Size: 9 x12 inches.
 3. Thickness: 1/4 inch.
 4. Colors: As listed in the Legend-Finish or, if not listed, as selected by Architect from manufacturer's full range.
- F. **Trim Units:** Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
 2. Shapes: As follows, selected from manufacturer's standard shapes:
 - a. Base for Portland Cement Mortar Installations: Coved, flush.
 - b. Base for Thin-Set Mortar Installations: As shown on Drawings.
 - c. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose.
 - d. External Corners for Thin-Set Mortar Installations: Surface bullnose.
 - e. Internal Corners: Field-buttet square corners, except with coved base and cap angle pieces designed to member with stretcher shapes.

2.4 WATERPROOFING FOR TILE INSTALLATIONS

- A. **General:** Provide products that comply with ANSI A118.10 and the descriptions in this Article.

- B. **Polyethylene Sheet Waterproofing:** Manufacturer's standard proprietary product consisting of composite sheets, 60 inches wide by a nominal thickness of 0.030 inch, composed of an inner layer of chlorinated polyethylene sheet faced on both sides with laminated high-strength nonwoven polyester material, designed for embedding in latex-Portland cement mortar, and as substrate for latex-Portland cement mortar setting bed.
1. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
 - a. Manufacturer: Noble Company.
 - b. Product: "Nobleseal TS".

2.5 METAL TRIMS

- A. **Acceptable Manufacturer:** Subject to compliance with requirements of Contract Documents, provide products as listed on Legend-Finish or indicated on Drawings by the following manufacturer:
1. Schluter Systems LP
- B. **Material:** Aluminum.
- C. **Shapes:** As indicated on Legend-Finish.
- D. **Finishes:** Anodized aluminum.

2.6 THRESHOLDS

- A. **General:** Provide thresholds that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.
1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. **Molded Thresholds:**
1. Solid Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with the material and performance requirements of ANSI Z124.3, Type 5 or Type 6, without a pre-coated finish.
 2. Available Products: Subject to compliance with requirements of Contract Documents, products that may be incorporated in the Work include, but are not limited to, the following:
 - a. Corian; DuPont Polymers.
 - b. Solid Surface; Formica Corp.
 3. Properties:
 - a. Thresholds: Minimum 1/2 inch thick.
 - b. Provide tapered front edge.
 - c. Thresholds shall be continuous between door jambs.
 - d. Provide colors as selected by architect from manufacturer's standard selection of colors.

2.7 SETTING MATERIALS

- A. **Latex-Portland Cement Mortar:** ANSI A118.4, and ISO C2ES2P2 (cementitious (C), improved (2), extended open time (E), highly deformable (S2), improved plywood adhesion (P2)), composed as follows:
1. Mixture of Dry-Mortar Mix and Latex Additive: Mixture of prepackaged dry-mortar mix and liquid-latex additive complying with the following requirements:
 - a. Basis of Design: Laticrete 3701 or Mapei Kerabond / Keralastic.
 - b. Latex Additive: Styrene butadiene rubber.
 - c. For wall applications, provide nonsagging, latex-portland cement mortar complying with ANSI A118.4 for mortar of this type defined in Section F-2.1.2.

2.8 GROUTING MATERIALS

- A. **Latex-Portland Cement Grout:** ANSI A118.6 for materials described in Section H-2.4, composed as follows:
1. Mixture of Dry-Grout Mix and Latex Additive: Mixture of factory-prepared, dry-grout mix and latex additive complying with the following requirements:
 - a. Dry-Grout Mix: Dry-set grout complying with ANSI A118.6 and ISO CG2WA (cementitious grout (CG), improved (2), with reduced water absorption (W) and high abrasion resistance (A)) , for joints 1/8 inch (3.2 mm) and narrower.
 - 1) Basis of Design: Laticrete "Permacolor".
 - 2) Stain Resistant Additive: Manufacturer's standard, in lieu of water.
 - 3) Protection:
 - (a) Use only at temperatures between 50 degrees F and 100 degrees F.
 - (b) At showers and tub surrounds, restrict use for 48 hours; at steam showers, restrict use for 14 days.
 - (c) Keep installation from immersion in water and protect from rain and freezing for at least 21 days after completion.
 - (d) Floors: Keep free from heavy traffic for at least 3 hours after grouting.
 - (e) Walls: Protect from impact, vibration, and hammering on adjacent and opposite walls for 14 days after tile installation.
 - (f) Allow for extended periods of cure and protection when temperatures drop below 60 degrees F or when the relative humidity is higher than 70 percent.
 - b. Colors: As indicated on Legend-Finish Schedule and as selected by Architect from manufacturer's full range of colors.
- B. **Specialty Grouts:** Ready-to-use grouts with glass-bead aggregate, where required by Architect.
1. Available Products: Subject to compliance with requirements of Contract Documents, products which may be incorporated into the Work include, but are not limited to, the following:
 - a. Mapei Flexcolor™ 3D.
 - b. Bostik Dimension® Rapidcure™.
 2. Colors: As selected by Architect from manufacturers' full range.

2.9 ELASTOMERIC SEALANTS

- A. **General:** Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."
- B. **Colors:** Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.
- C. **One-Part, Mildew-Resistant Silicone Sealant:** ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.
- D. **Multipart, Pourable Urethane Sealant for Use T:** ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.
- E. **Available Products:** Subject to compliance with requirements, products which may be incorporated into the Work include, but are not limited to, the following:
 - 1. One-Part, Mildew-Resistant Silicone Sealants:
 - a. Dow Corning 786; Dow Corning Corporation.
 - b. Sanitary 1700; GE Silicones.
 - c. Pecora 898 Sanitary Silicone Sealant; Pecora Corp.
 - d. Tremsil 600 White; Tremco, Inc.
 - 2. Multipart, Pourable Urethane Sealants:
 - a. Chem-Calk 550; Bostik.
 - b. Vulkem 245; Mameco International, Inc.
 - c. NR-200 Urexpan; Pecora Corp.
 - d. THC-900; Tremco, Inc.

2.10 MISCELLANEOUS MATERIALS

- A. **Trowelable Underlayments and Patching Compounds:** Latex-modified, Portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. **Metal Edge Strips:** White-zinc-alloy terrazzo strips, 1/8 inch wide at top edge with integral provision for anchorage to mortar bed or substrate, unless otherwise indicated.
- C. **Temporary Protective Coating:** Provide product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; is compatible with tile, mortar, and grout products; and is easily removable after grouting is completed without damaging grout or tile.
 - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 degrees F per ASTM D 87.
- D. **Tile Cleaner:** A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

- E. **Grout Sealer:** Solvent-based, no-sheen, natural-look penetrating sealer for all sanded and non-sanded grout joints.
 - 1. Available Products: Subject to compliance with requirements of Contract Documents, products that may be incorporated in the Work include, but are not limited to, the following:
 - a. AQUA MIX, Inc., Sealers Choice.

2.11 MIXING MORTARS AND GROUT

- A. **Mix mortars** and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. **Add materials and additives in accurate proportions.** Do not use or add any water to mortar or grout when mixing, use only latex additive.
- C. **Obtain and use type of mixing equipment,** mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Examine substrates,** areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
 - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
 - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.
- B. **Do not proceed** with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. **Remove coatings,** including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- B. **Provide concrete substrates** for tile floors installed with dry-set or latex-Portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.
 - 1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
 - 2. Remove protrusions, bumps, and ridges by sanding or grinding.

- C. **Blending:** For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. **Field-Applied Temporary Protective Coating:** Where indicated under tile type or needed to prevent adhesion or staining of exposed tile surfaces by grout, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating them with a continuous film of temporary protective coating indicated below, taking care not to coat unexposed tile surfaces:
 - 1. Petroleum paraffin wax, applied hot.

3.3 INSTALLATION, GENERAL

- A. **ANSI Tile Installation Standards:** Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. **TCNA Installation Guidelines:** TCNA's "Handbook for Ceramic Tile Installation." Comply with TCNA installation methods indicated in ceramic tile installation schedules.
- C. **Extend tile work into recesses** and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. **Accurately form intersections and returns.** Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. **Jointing Pattern:** Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.
- F. **Lay out tile wainscots** to next full tile beyond dimensions indicated.
- G. **Expansion Joints:** Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated or if not indicated as recommended by TCNA guidelines, during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
 - 2. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."
- H. **Grout tile to comply** with the requirements of the following tile installation standards:
 - 1. For ceramic tile grouts (sand-Portland cement, dry-set, commercial Portland cement, and latex-Portland cement grouts), comply with ANSI A108.10.

3.4 FLOOR TILE INSTALLATION

- A. **General:** Install tile to comply with requirements in the Ceramic Tile Floor Installation Schedule, including those referencing TCNA installation methods and ANSI A108 series of tile installation standards.
1. **Movement Joints:** Provide movement joints as recommended by TCNA EJ171-09 "Movement Joint Design Essentials". Space joints as indicated on the drawings, if not shown on the drawings space joints as recommended by TCNA guidelines. Coordinate with the Architect for precise location of joints, locate joints as follows:
 - a. Interior: Space joints not greater than 20 feet in each direction interior spaces.
 - b. Exterior or interior exposed to direct sunlight: Space joints not greater than 8 feet in each direction.
 - c. Provide joints where tile work abuts restraining surfaces such as perimeter walls, dissimilar floors, curbs, columns, pipes, ceilings and where changes occur in backing materials. Not at drain strainers.
 - d. Provide joints where the following conditions exist: at all expansion, control, construction, cold and seismic joints, including such conditions at vertical surfaces.
 2. **Installation Methods:**
 - a. Tile over Concrete Surfaces in Shower Areas: TCNA F122.
 - 1) Waterproof membrane meeting ANSI A118.10.
 - 2) Mortar meeting ANSI A108.1A.
 - b. Tile over Concrete Surfaces: TCNA F125A.
- B. **Joint Widths:** Install tile on floors with the following joint widths:
1. Porcelain Mosaic Tile: 1/8 inch.
 2. Ceramic Mosaic Tile: 1/16 inch.
 3. Ceramic Tile: 1/16 inch.
- C. **Back Buttering:** For installations indicated, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
1. Tile floors composed of tiles 8 by 8 inches (203 by 203 mm) or larger.
 2. Tile floors installed with chemical-resistant grouts.
- D. **Thresholds:** Install thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
1. Set thresholds in latex-Portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent non-tile floor finish.
- E. **Metal Edge Strips:** Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- F. **Apply two (2) coats of grout sealer** in accordance with manufacturer's printed instructions and recommendations. Remove sealer remaining on the tile within 3 to 5 minutes of application.

3.5 WALL TILE INSTALLATION

- A. **Install** types of tile designated for wall installations to comply with requirements in the Ceramic Tile Wall Installation Schedule, including those referencing TCNA installation methods and ANSI setting-bed standards.
1. Installation Methods:
 - a. Tile over Masonry Surfaces: TCNA W211.
 - b. Tile over glass mat tile backer panels - Interior Surfaces: TCNA W244C.
 - c. Tile for Showers: TCNA B431.
- B. **Joint Widths:** Install tile on walls with the following joint widths:
1. Ceramic Tile: 1/16 inch.
 2. Wall Tile: 1/16 inch.
- C. **Back Buttering:** For installations indicated, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
1. Tile wall installations in wet areas, including showers.
 2. Tile wall installations composed of tiles 8 by 8 inches or larger.
- D. **Apply two (2) coats of grout sealer** in accordance with manufacturer's printed instructions and recommendations. Remove sealer remaining on the tile within 3 to 5 minutes of application.

3.6 CLEANING AND PROTECTING

- A. **Cleaning:** On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
1. Remove latex-Portland cement grout residue from tile as soon as possible.
 2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
 3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
- B. **Finished Tile Work:** Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
- C. **Provide final protection** and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure tile is without damage or deterioration at the time of Substantial Completion.
- D. **When recommended by tile manufacturer,** apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
- E. **Prohibit foot and wheel traffic** from tiled floors for at least 7 days after grouting is completed.
- F. **Before final inspection,** remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

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SECTION 09 5100

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. Section **includes acoustical ceiling tile, suspension system and accessories.**

1.3 SUBMITTALS

- A. **Product Data:** Manufacturer's product specifications and installation instructions for each acoustical ceiling material required, and for each suspension system, including certified laboratory test reports and other data as required to show compliance with these specifications.
 - 1. Include manufacturer's recommendations for cleaning and refinishing acoustical units, including precautions against materials and methods which may be detrimental to finishes and acoustical performances.
- B. **Samples:** Set of 6 inch x 4 inch samples for each acoustical unit required, showing full range of exposed color and texture to be expected in completed work.
 - 1. Set of 12 inch long samples of each exposed runner and molding.

1.3 QUALITY ASSURANCE

- A. **Installer Qualifications:** Firm with not less than three years of successful experience in installation of acoustical ceilings similar to requirements for this project and which is acceptable to manufacturer of acoustical units, as shown by current written statement from manufacturer.
- B. **Fire Performance Characteristics:** Provide acoustical ceiling components that are identical to those tested for the following fire performance characteristics, according to ASTM test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspecting agency.
 - 1. Surface Burning Characteristics: As follows, tested per ASTM E 84.
 - a. Flame Spread: 25 or less.
 - b. Smoke Developed: 50 or less.
 - 2. Fire Resistance Ratings: As indicated by reference to design designation in UL "Fire Resistance Directory" or "FM Approval Guide", for floor, roof or beam assemblies in which acoustical ceilings function as a fire protective membrane; tested per ASTM E 119. Provide protection materials for lighting fixtures and air ducts to comply with requirements indicated for rated assembly.
- C. **Seismic Standard:** Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 - 1. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies--Seismic Zones 3 & 4."

- D. **Coordination of Work:** Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition system (if any).

1.4 DELIVERY, STORAGE, AND HANDLING

- A. **Deliver acoustical ceiling units** 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 or other causes.
- B. Before installing acoustical ceiling units, **permit them to reach room temperature** and stabilized moisture content.
- C. **Handle acoustical ceiling units carefully** to avoid chipping edges or damaging units in any way.

1.5 PROJECT CONDITIONS

- A. **Space Enclosure:** Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings completed, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

1.6 EXTRA MATERIALS

- A. Deliver stock of maintenance material to Owner. Furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.
1. Acoustical Ceiling Units: Furnish quantity of full size units equal to 2 percent of amount installed.
 2. Exposed Suspension Components: Furnish quantity of each exposed component required for actual installation equal to 2 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. **Acceptable Manufacturers:** Subject to compliance with requirements of Contract Documents, provide products by one of the following:
1. Suspension System:
 - a. Armstrong.
 - b. Chicago Metallic Corp.
 - c. USG/Donn Corp.
 - d. National Rolling Mills, Inc.
 2. Acoustical Tile:
 - a. Rockfon.
 3. Acoustical Sealant:
 - a. Tremco Acoustical Sealant; Tremco.
 - b. USG Acoustical Sealant; United States Gypsum Co.
 - c. Chem-Calk 600; Woodmont Products, Inc.
 - d. Pecora Corp; AC 20 FTR Acoustical and Insulation Sealant

2.2 MATERIALS

A. Acoustical Ceiling Units:

1. General: Provide manufacturer's standard units of configuration indicated which are prepared for mounting method designated and which comply with FS SS-S-118 requirements, including those indicated by reference to type, form, pattern, grade (NRC or NIC's as applicable), light reflectance coefficient (LR), edge detail, and joint detail (if any).
2. Mounting Method for Measuring NRC: No. 7 (mechanically mounted on special metal support), FS SS-S-118; or Type E-400 mounting as per ASTM E 795.
3. Sound Attenuation Performance: Provide acoustical ceiling units with ratings for ceiling sound transmission class (STC) of range indicated as determined according to AMA 1-II "Ceiling Sound Transmission Test by Two-Room Method" with ceilings continuous at partitions and supported by a metal suspension system of type appropriate for ceiling unit of configuration indicated (concealed for tile, exposed for panels).
4. Recycled content: Ceiling tile to have a minimum of 50 percent recycled content.

B. Ceiling Types:

1. Type A: Rockfon Sonar®
 - a. Size: 24 inches x 24 inches x 5/8 inch.
 - b. Edge: Square-Cut Lay-In
 - c. CAC: N/A
 - d. LR: 0.85
 - e. NRC: 0.95
 - f. ASTM E1264 Classification: Type XX, Pattern E.
2. Type B: Rockfon Koral™
 - a. Size: 24 inches x 48 inches x 5/8 inch.
 - b. Edge: Square-Cut Lay-In
 - c. CAC: N/A
 - d. LR: 0.86
 - e. NRC: 0.85
 - f. ASTM E1264 Classification: Type XX, Pattern E.
3. Type F: Rockfon Cinema Black™ (for use above wood grille ceiling panels)
 - a. Size: 24 inches x 24 inches x 5/8 inch.
 - b. Edge: Square-Cut Lay-In
 - c. CAC: N/A
 - d. LR: 0.04
 - e. NRC: 0.85
 - f. ASTM E1264 Classification: Type XX, Pattern E.

C. Suspension System: Provide metal suspension systems of type, structural classification and finish indicated which comply with applicable ASTM C 635 requirements.

1. Finishes and Colors: Provide manufacturer's standard finish for type of system indicated, unless otherwise required. For exposed suspension members and accessories with painted finish, provide color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's full range of standard colors.
2. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung.

3. Hanger Wire: Galvanized carbon steel wire, ASTM A 641, soft temper, pre-stretched, Class 1 coating, sized so that stress at 3- times hanger design load (ASTM C 635, Table 1, Direct Hung), will be less than yield stress of wire, but provide not less than 12 gage.
 4. Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
 - a. For lay-in panels with reveal edge details, 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.
 - b. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
 - c. Provide shadow reveal molding with width of reveal equal to depth of reveal.
 5. Hold-Down Clips: Minimum 24 gauge spring steel, 1-7/16 inches deep x 7/8 inches wide, designed to fit over cross tees. Provide clips spaced symmetrically 2 ft. o.c.
 6. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces. Struts will be required at 12 feet on center both ways for all suspended ceilings according to UBC Standard 25-2.
 - a. In lieu of compression struts provide a seismic clip with an ES Report number from ICC demonstrating that the compression struts and the 2 inch perimeter wall mold are not required. Available Products:
 - 1) Armstrong: 2 inch BERC seismic clips
 - 2) Chicago Metallic Corp. 1496 Perimeter Clip.
 7. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, pre-painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation, with pre-finished 15/16-inch- wide metal caps on flanges.
 - a. Structural Classification: Heavy-duty system.
 - b. End Condition of Cross Runners: Butt-edge type.
 - c. Face Design: Flat, flush.
 - d. Cap Material: Steel or aluminum cold-rolled sheet.
 - e. Cap Finish: Painted in color as selected from manufacturer's full range.
- D. **Miscellaneous Materials:**
1. Acoustical Sealant: Resilient, non-staining, non-shrinking, non-hardening, non-skinning, non-drying, non-sag sealant intended for interior sealing of concealed construction joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. **Coordination:** Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.
 1. Furnish concrete inserts, steel deck hanger clips and similar devices to other trades for installation well in advance of time needed for coordination of other work.

- B. **Layout:** Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans wherever possible.

3.2 INSTALLATION

- A. **General:** Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to work.
- B. **Arrange acoustical units** and orient directionally-patterned units (if any) in manner shown by reflected ceiling plans.
 - 1. Install tile with pattern running in one direction.
- C. **Install suspension systems to comply with ASTM C 636**, with hangers supported only from building structural members. Locate hangers not less than 6 inches from each end and spaced 4'-0" along each carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of 1/8 inch in 12'-0". Comply with detail on drawings for seismic bracing.
- D. **Secure wire hangers** by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, countersplaying or other equally effective means.
- E. **Install hangers** of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.
 - 1. 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 tolerance of 1/8 inch in 12'-0". Miter corners accurately and connect securely.
- F. **Install acoustical panels** in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.
 - 1. Paint cut and exposed edges of acoustical tile.
 - 2. Install hold-down clips in areas indicated, and in areas where required by governing regulations or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.

3.3 ADJUST AND CLEAN

- A. **Clean exposed surfaces** of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

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SECTION 09 5426

PANEL GRILLE SUSPENDED WOOD CEILING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. **Section includes:**
1. Custom-built or manufactured panel grilles and suspension dowel clips necessary to complete installation
 2. Design engineering for system.
- B. **Related Sections:**
1. Section 09 5100 "**Acoustical Ceilings**" for grid suspension system.
 2. Section 09 9100 "**Painting**" for finish of exposed structure above.
 3. **Fire Protection, Mechanical and Electrical** sections for systems penetrating or located above panel grille suspended ceilings.

1.3 QUALITY ASSURANCE

- A. **Installer Qualifications:** Installer must be a firm with a minimum of two (2) years of successful experience in installation of suspended wood ceilings of similar requirements to this project. Installer must be acceptable to Architect, manufacturer, and Owner's representative.
- B. **Fire Performance Characteristics:** When specified as "Fire Resistant", Panel Grille wood strips shall conform to Class 1, or A flame spread rating, when tested according to ASTM E-84.
- C. **Environmental Standards:** When required the wood ceiling shall originate from well managed forests as certified by accredited and recognized industry certifying organizations.
- D. **Mock-up:** Provide, in place a representative sample to be reviewed by the Architect and Owner prior to proceeding.
1. Provide mockup in the location directed by Architect.
 2. Mockup shall be used to determine general aesthetic effect, thickness and other properties of completed installation.
 - a. Proper masking of adjoining surfaces is crucial to installation.
 - b. Provide spray-acoustic insulation above wood ceiling system mockup, in color selected by Architect from manufacturer's full range. Architect reserves the right to change color of insulation for final installation.
 3. Approved mockup may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 PROJECT CONDITIONS

- A. **Installation shall be done only when** the temperature and humidity closely approximate the interior conditions that will exist when the building is occupied. The heating and cooling systems shall be operating before, during, and after installation, with the humidity of the interior spaces maintained between 25 and 55 percent.
- B. **Plenums must have proper ventilation**, especially in high moisture areas, without excessive heat build-up in the ceiling areas.
- C. **Prior to the start of installation**, all exterior windows and doors are to be in place, glazed, and weather-stripped. The roof is to be watertight, and all wet trades' work is to be completed, and thoroughly dry.
- D. **Mechanical, electrical, and other utility service installations** above the ceiling plane shall have been completed. No materials should rest against, or wrap around, the ceiling suspension components or connecting hangers.

1.5 COORDINATION OF WORK

- A. **Coordinate layout and installation** of Panel Grilles and ceiling suspension system with other work penetrating the ceiling including light fixtures, HVAC equipment, and fire suppression system components.

1.6 SUBMITTALS

- A. **Product Data:** Product specifications and installation instructions for all supplied ceiling materials.
- B. **Shop Drawings:** Shop drawings showing Panel Grille lengths, and placement of hangers, T-rail carriers, and other details deemed pertinent to proper installation.
 - 1. **Seismic Restraint - Deferred Submittal:** To be furnished to the Architect for submission to the Building Code Official for structural review.
- C. **Samples:** 12 x12 inch wood ceiling samples, in the specified Panel Grille styles, with finish applied.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. **Deliver panel grilles and components** to the project site in original, unopened packages.
- B. **Store panel grilles flat, level and off the floor** in a fully enclosed space. For a minimum of seventy-two (72) hours immediately prior to ceiling installation, the panel grilles shall be stored in the room in which they will be installed. The temperature and humidity of the room shall closely approximate those conditions that will exist when the building is occupied.

1.8 WARRANTIES

- A. **Manufacturer:** Materials supplied by the ceiling manufacturer shall be guaranteed against manufacturing defects for one (1) year.
- B. **Contractor:** Work shall be guaranteed for one (1) year from final acceptance of completed work.

PART 2 - PRODUCT

2.1 PANEL GRILLES

- A. **Basis of Design:** Contract Documents are based on system specified below to establish a standard of quality. Other acceptable manufacturers with systems having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacturer: 9Wood.
 2. System: 1000 Wood Grille Series.
- B. **Acceptable Manufacturers:** Subject to compliance with requirements of Contract Documents, provide system by one of the manufacturers listed below. If not listed, submit as a substitution according to the Conditions of the Contract and provisions of Division 1 sections.
1. 9Wood; www.9wood.com
 2. ACG; www.acg.com.
 3. Armstrong Ceilings; www.armstrong.com
 4. Norton Industries; www.nortonceilings.com
 5. Rulon Company, www.rulonco.com.
 6. Instead of manufactured systems, Contractor may design and build custom system to match features and performance characteristics of Basis of Design. Conformance with design criteria shall be judged by Architect.
- C. **Properties:**
1. Panel grilles and suspension system shall be fire resistant, Class A rated. Fire resistive treatment shall not affect look or color of wood products.
 2. Panel Strips: Prime grade, walnut veneer, mixed grain; match Architect's sample.
 3. Panel Grille: Wood strips 1-5/16 inches wide x 3-1/4 inches deep with 5 strips per foot
 4. Standard Panel Grilles: Assembled 1 foot wide, in nominal lengths of 2 feet to 10 feet in 1 foot increments. Manufacture wood strips without finger-joints; fasten together with black dowels. Position dowels 5-1/2 inches from the ends and 12 inches on center, with interconnecting male-to-female dowel attachment for support of system.
 5. Provide panels with acoustically transparent black fabric backing; provide 24 x 24 x 1 inch black fiberglass infill panels above wood panels for acoustic control

2.2 SUSPENSION SYSTEMS

- A. **Suspend panel grilles** from standard heavy-duty 15/16 inch T-rail carriers, using panel manufacturer's dowel clips for connection when removability of panel grilles is necessary for access above the ceiling. Suspend T-rail carriers with #12 gauge wire hangers.
1. Colors as selected by Architect.
- B. **Design system to accommodate access** to systems above without extensive removal of slats or permanent distortion of or damage to overall system. Seams and hinges shall be concealed.
- C. **Design system to meet seismic requirements** of project location, including all necessary bracing and supports.

2.3 EDGES, BORDERS, AND PERIMETER TRIMS

- A. **Edges, borders, and perimeter trims:** As shown on Drawings.

- B. **All wood ceiling products** specified shall be supplied by the ceiling manufacturer.

2.4 FINISHES AND COLORS

- A. **Panel grilles** shall be shop-finished. Finishes as selected by the Architect.
- B. **Spray apply finishes** to a smooth-sanded surface.

PART 3 - EXECUTION

3.1 PREPARATION

- A. **Ceiling Layout:** Measure ceiling areas, and establish layout of Panel Grilles and T-rails, in accordance with installation instructions.
- B. **Coordination:** Furnish the layout for supports that shall be installed for suspension of ceilings. Provide concrete inserts, steel deck hanger clips, or similar devices for installation, in time to coordinate the work. Coordinate with other trades the location of devices which will penetrate the Ceiling Panels or interfere with the installation. Recessed or surface devices located within the ceiling panels are to be located and cut in the field.
- C. **Ceiling components and elements** located in or affecting panel ceiling shall be coordinated by the Contractor in the BIM model.

3.2 INSTALLATION

- A. **General:** Install materials in accordance with manufacturer's printed instructions. The installation shall comply with applicable regulations and industry standards.
- B. **Perimeters:** Using a leveling device, lay out and install the perimeter trim.
- C. **Suspension:** Suspend and level T-rail carriers in a direction perpendicular to the wooden strip direction. Use #12 gauge wire hangers to support T-rail carriers. Place hangers at 4 foot intervals along the carrier. Suspension system shall conform to seismic requirements of project location.
- D. **Wood Suspension:** Suspend Panel Grilles from the T-rail carrier system by dowel clips.

3.3 ADJUSTMENT, CLEANING, AND REPAIR

- A. **Make final adjustments** to level or contours.
- B. **Upon completion of ceiling installation**, clean Panel Grilles and borders free of dirt, dust, grease, oils, and fingerprints.
- C. **Remove, and replace with new**, work which cannot be successfully cleaned or repaired, shall be removed and replaced.

3.4 INSPECTION

- A. **Upon completion of ceiling installation**, Owner's representative shall inspect all finished surfaces to ensure that work has been performed in a manner satisfactory to the Owner. Any deficiencies in the installed ceiling shall be corrected by the Contractor at no additional cost to the Owner.

END OF SECTION

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SECTION 09 6519

RESILIENT FLOOR TILE 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. Luxury vinyl tile (LVT).
 - 2. Static-dissipative tile.
 - 3. Resilient wall base and accessories.
- B. **Related Sections:**
 - 1. **Legend-Finish** on Drawings for color and pattern selections.

1.3 SUBMITTALS

- A. **Product Data:** For each type of product indicated.
- B. **Samples for Initial Selection:** For each type of product indicated (where a selection has not been indicated in the Legend-Finish).
- C. **Samples for Verification:** Full-size units of each color and pattern of resilient floor tile required.
 - 1. Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches long, of each resilient product color and pattern 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.
- B. **Mockups:** Build mockup of rubber wall base, including both inside and outside corners, for Architect's approval and to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion

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 degrees F or more than 90 degrees F. Store tiles on flat surfaces.

1.6 PROJECT CONDITIONS

- A. **Maintain temperatures** within range recommended by manufacturer, but not less than 70 degrees F or more than 95 degrees 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 post-installation period**, maintain temperatures within range recommended by manufacturer, but not less than 55 degrees F or more than 95 degrees 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.
 - 2. Resilient Wall Base and Accessories: 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 LUXURY VINYL TILE (SOLID VINYL)

- A. **Available Manufacturers:** Subject to compliance with requirements of Contract Documents, manufacturers offering products which may be incorporated into the Work include, but are not limited to, the following:
 - 1. Manufacturer: Mannington Commercial
 - 2. Product: Nature's Paths

- B. **Tile Standards:** ASTM F 1700.
1. Class: Class III printed film vinyl tile.
 2. Type: B, smooth surface; finish: UV-cured polyurethane.
 3. Overall Thickness: 0.098 inch
 4. Wear Layer Thickness: 0.020 inch.
 5. Size: 6 x 36 inches, plank; as indicated on Legend-Finish.
 6. Finish: Urethane with aluminum oxide.
 7. Edge: Micro-bevel
- C. **Colors and Patterns:** As listed in the Legend-Finish on Drawings.

2.2 STATIC DISSIPATIVE VINYL TILE

- A. **Acceptable Products:** Subject to compliance with requirements of Contract Documents, provide the following products. Other products must be submitted as substitutions prior to the receipt of bids and according to the Conditions of the Contract, the requirements of Division 1 sections and as noted on the Finish Schedule.
1. Type SD2 (Tile)
 - a. Manufacturer: Flexco.
 - b. Product: Delane ESD Vinyl.
- B. **Color and Pattern:** As indicated on Legend-Finish Schedule or, if not indicated, as selected by Architect from manufacturer's full range.
- C. **Characteristics:**
1. ASTM F 1700, Class 1, Type A.
 2. Wearing Surface: Smooth.
 3. Thickness: 1/8 inch.
 4. Size: 24 x 24 inches.
 5. Fire-Test-Response Characteristics:
 - a. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.
 6. Electrostatic Properties:
 - a. ANSI/ESD S7.1: 7.5×10^8 , 12% RH, tested surface to ground
 - b. Meet OSHA/NFPA ($> 2.5 \times 10^4$ ohms): 6.2×10^7 ohms
 - c. Meet ASTM F 150, 10^6 to 10^9 ohms (50% RH, 100v): 6.2×10^7 ohms
 - d. ESD-approval (IEC 61340 / 100v): 10^7

2.3 RESILIENT WALL BASE

- A. **Available Manufacturers:** Subject to compliance with requirements of Contract Documents, manufacturers with products that may be incorporated into the Work include, but are not limited to, the following:
1. Roppe Corporation; www.roppe.com.
- B. **Characteristics - ASTM F 1861**
1. Type (Material Requirement): TS (rubber, thermoset).
 2. Group (Manufacturing Method): I (solid, homogeneous).
 3. Style: Coved.
 4. Minimum Thickness: 0.125 inch.
 5. Height: 4 inches.
 6. Lengths: Coils in manufacturer's maximum length.
 7. Outside Corners: Field formed.
 8. Inside Corners: Field formed.
 9. Surface: Smooth.

2.5 RESILIENT MOLDING ACCESSORY

- A. **Applications**, including but not limited to: Carpet bar for tackless installations, carpet edge for glue-down applications, nosing for carpet, nosing for resilient floor covering, reducer strip for resilient floor covering, and joiner for tile and carpet.
- B. **Available Manufacturers:** Subject to compliance with requirements of Contract Documents, manufacturers with products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Burke Mercer Flooring Products, Division of Burke Industries, Inc.; www.burkeflooring.com.
 - 2. Tarkett (Johnsonite); www.johnsonite.com
 - 3. FLEXCO; www.flexcofloors.com
 - 4. Roppe Corporation; www.roppe.com.
- C. **Material:** Rubber, to match wall base.

2.6 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.
- C. **Metal Edge Strips:** Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

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 finishes of substrates comply with tolerances and other requirements specified in other Sections and 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.
- 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.

- H. **Static Dissipative Tile:** Install in accordance with manufacturer's written installation instructions; install copper grounding strips and extend to known ground.

3.4 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. **Field-formed Corners:** Wrap base continuously around corners. Seams shall occur in inside corners only.

3.5 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.

3.6 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

SECTION 09 6813

CARPET 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 **carpet tile, and carpet accessories** as shown on the Drawings and specified herein.
- B. **Related Sections** include the following:
 - 1. Section "**Resilient Floor Tile**" for resilient wall base and accessories installed with carpet.

1.3 REFERENCES

- A. **The Carpet and Rug Institute (CRI):** "Standard for Installation of Commercial Carpet" CRI 104, September 2015

1.4 SUBMITTALS

- A. **Product Data:** For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.
- B. **Shop Drawings:** Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
 - 2. Carpet type, color, and dye lot.
 - 3. Locations where dye lot changes occur.
 - 4. Seam locations, types, and methods.
 - 5. Type of subfloor.
 - 6. Type of installation.
 - 7. Pattern type, repeat size, location, direction, and starting point.
 - 8. Pile direction.
 - 9. Type, color, and location of insets and borders.
 - 10. Type, color, and location of edge, transition, and other accessory strips.
 - 11. Transition details to other flooring materials.
- C. **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 Tile: One full size square of each style and color.
 - 2. Exposed Edge Stripping and Accessory: 12-inch-long Samples.
- D. **Product Schedule:** Use same room and product designations indicated on Drawings and in schedules.

- E. **Maintenance Data:** For carpet to include in maintenance manuals specified in Division
 - 1. 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.

1.5 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.
- C. **Product Options:** Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. **General:** Comply with CRI standard.

1.7 PROJECT CONDITIONS

- A. **General:** Comply with CRI standard.
- 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** and are sufficiently dry to bond with adhesive and concrete slabs 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.

1.8 WARRANTY

- A. **General Warranty:** Special warranty 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.
- B. **Special Carpet Warranty:** Written warranty, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
 - 1. Warranty Period: Lifetime Commercial Limited.

1.9 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 tiles equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. **Acceptable Manufacturer:** Subject to compliance with requirements of Contract Documents, provide carpet tiles by the manufacturer listed below.
1. Manufacturer: Shaw Contract Group.
- B. **Products:**
1. Carpet 'F1'.
 - a. Style Name: Stipple Tile
 - b. Style Number: 5T116
 - c. Collection: Hand Drawn
 - d. Color Name and Number: As indicated in Legend-Finish.
 - e. Construction: Multi-level pattern cut/loop
 - f. Fiber Product: Eco Solution Q Nylon
 - g. Protective Treatment: SSP® Shaw Soil Protection
 - h. Gauge: 1/12
 - i. Stitches per Inch: 9.0
 - j. Finished Pile Thickness: 0.108 inches
 - k. Dye Method: 100 percent Solution Dyed
 - l. Secondary Backing: Ecoworx Tile
 2. **Carpet 'F2'.**
 - a. Style Name: Form Tile
 - b. Style Number: 5T136
 - c. Collection: Noble Materials
 - d. Color Name and Number: As indicated in Legend-Finish.
 - e. Construction: Multi-level pattern cut/loop
 - f. Fiber Product: Eco Solution Q® Nylon
 - g. Protective Treatment: SSP® Shaw Soil Protection
 - h. Gauge: 1/10
 - i. Stitches per Inch: 8.0
 - j. Finished Pile Thickness: 0.149 inches.
 - k. Dye Method: 100 percent Solution Dyed
 - l. Secondary Backing: Ecoworx Tile

2.2 INSTALLATION ACCESSORIES

- A. **Trowelable Leveling and Patching Compounds:** Latex-modified, hydraulic-cement-based formulation provided by or recommended by the following:
1. Carpet manufacturer.
- B. **Adhesives:** Water-resistant, mildew-resistant, non-staining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and that is recommended by carpet manufacturer.

- C. **Rubber Accessory Molding:** Provide rubber accessory molding complying with the following:
 - 1. Color: As selected by Architect from manufacturer's full range of colors produced for rubber accessory molding complying with requirements indicated.
 - 2. Product Description: Including but not limited to carpet edge for glue-down applications, carpet nosing, tile and carpet joiner.
 - 3. Profile and Dimensions: As indicated and as required.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Examine substrates, areas, and conditions** for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.
- 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 standard and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.
- B. **Use trowelable leveling and patching compounds**, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- 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. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. **Direct-Glue-Down Installation:** Comply with CRI standard.
- B. **Comply with carpet manufacturer's written recommendations** 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.
 - 1. Level adjoining border edges.

- C. **Do not bridge building expansion joints** with carpet.
- D. **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.
- E. **Extend carpet** into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. **Maintain reference markers**, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on sub-floor. Use nonpermanent, non-staining marking device.
- G. **Install pattern parallel** to walls and borders.

3.4 CLEANING AND PROTECTION

- 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 standard.
- 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

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SECTION 09 7200

WALL COVERINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. **Section Includes:**
 - 1. Heavy-duty wall coverings.
- B. **Related Sections:**
 - 1. **Legend-Finish** on Drawings for patterns and colors.
 - 2. Section 09 2900 "**Gypsum Board**" for finishing of gypsum substrates behind wall coverings.
 - 3. Section 10 2600 "**Wall and Corner Guards**" for PVC protective wall coverings.

1.3 ACTION SUBMITTALS

- A. **Product Data:** For each type of product.
 - 1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
- B. **Shop Drawings:** Show location and extent of each wall-covering type. Indicate seams and termination points.
- C. **Samples:** For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36-inch- long in size.

1.4 CLOSEOUT SUBMITTALS

- A. **Maintenance Data:** For wall coverings to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. **Furnish extra materials**, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wall-Covering Materials: For each type, color, texture, and finish, full width by length to equal to 5 percent of amount installed.

1.6 QUALITY ASSURANCE

- A. **Mockups:** Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for installation.
 - 1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F 1141 for appearance shading characteristics.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

- A. **Environmental Limitations:** Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.
- B. **Lighting:** Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.
- C. **Ventilation:** Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. **Fire-Test-Response Characteristics:** As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. **Surface-Burning Characteristics:** Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 15 or less.

2.2 WALL COVERINGS (WP1/WP2)

- A. **Acceptable Manufacturer:** Subject to compliance with requirements of Contract Documents, provide product by the following manufacturer:
 1. Manufacturer: Maharam
 2. Product: Nook 399913, "Rock".
- B. **Physical Properties:**
 1. Content: 100 percent non-phthalate vinyl.
 2. Finished total weight: 20 oz./linear yard.
 3. Backing Type: Polyester/cotton Osnaburg
- C. **Surface Properties**
 1. Traffic: High/Heavy duty
 2. Lightfastness: 200 hours +.
- D. **Colors, Textures, and Patterns:** As indicated in Legend-Finish on Drawings.

2.3 ACCESSORIES

- A. **Adhesive:** Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.
- B. **Primer/Sealer:** Mildew resistant, complying with requirements in Section 09 9123 "Painting" and recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Examine substrates and conditions**, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. **Proceed with installation only after** unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. **Comply with manufacturer's written instructions** for surface preparation.
- B. **Clean substrates** of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. **Prepare substrates** to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 2. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. **Check painted surfaces** for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.
- E. **Remove hardware and hardware accessories**, electrical plates and covers, light fixture trims, and similar items.
- F. **Acclimatize wall-covering materials** by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 WALL-COVERING INSTALLATION

- A. **Comply with wall-covering manufacturers' written installation instructions** applicable to products and applications indicated.
- B. **Cut wall-covering strips** in roll number sequence. Change the roll numbers at partition breaks and corners.
- C. **Install strips in same order** as cut from roll.
- D. **Install wall covering without lifted or curling edges** and without visible shrinkage.

- E. **Install seams vertical and plumb** at least 6 inches from outside corners and 3 inches from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.
- F. **Trim edges and seams** for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.
- G. **Fully bond wall covering** to substrate. Remove air bubbles, wrinkles, blisters, and other defects.
- H. **Install trim pieces** as indicated on Drawings and as noted above.

3.4 **CLEANING**

- A. **Remove excess adhesive** at seams, perimeter edges, and adjacent surfaces.
- B. **Use cleaning methods recommended** in writing by wall-covering manufacturer.
- C. **Replace strips that cannot be cleaned.**
- D. **Reinstall hardware and hardware accessories**, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION

SECTION 09 7219

ACOUSTIC TEXTILE WALL COVERINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. **Section Includes:**
 - 1. Acoustic textile wall panels.
- B. **Related Sections:**
 - 1. **"Legend-Finish"** on Drawings for color and pattern selections.
 - 2. Section 09 2900 **"Gypsum Board"** for preparation of substrate to receive textile wall panel wall coverings.

1.3 PREINSTALLATION MEETINGS

- A. **Preinstallation Conference:** Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. **Product Data:** For each type of product.
 - 1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
- B. **Shop Drawings:** Show location and extent of each wall-covering type. Indicate seams and termination points.
- C. **Samples:** For each type of textile wall covering and for each color, pattern, texture, and finish specified, full width by 36-inch-long in size.
 - 1. Samples: From same production run to be used for the Work, with specified treatments applied.

1.5 INFORMATIONAL SUBMITTALS

- A. **Product Test Reports:** For each wall covering, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

- A. **Maintenance Data:** For wall coverings to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. **Furnish extra materials**, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustic Textile Wall Covering Materials: For each type, color, texture, and finish, full width by length to equal to 5 percent of amount installed.

1.8 QUALITY ASSURANCE

- A. **Mockups**: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for installation.
 - 1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F 1141 for appearance shading characteristics.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 FIELD CONDITIONS

- A. **Environmental Limitations**: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.
- B. **Lighting**: Do not install wall panels until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.
- C. **Ventilation**: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. **Fire-Test-Response Characteristics**: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 50 or less.

2.2 ACOUSTIC TEXTILE WALL PANELS (S3)

- A. **Acceptable Manufacturer:** Subject to compliance with requirements, provide products by the following:
 - 1. Manufacturer: Autex; autexacoustics.com.
 - 2. Product: Cube.
- B. **Description:** Acoustically absorbent panels with felt-like finish; thermally bonded high density polyester; pressure sensitive adhesive backing.
- C. **Thickness:** 1/2 inch.
- D. **Size:** Custom, as indicated on Drawings.
- E. **NRC (ASTM C423):** 0.45.
- F. **Colors, Textures, and Patterns:** As indicated in Legend-Finish on Drawings or, if not indicated, as selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

- A. **Adhesive:** Mildew-resistant, non-staining adhesive, for use with specific wall panel and substrate application indicated and as recommended in writing by textile wall-covering manufacturer.
- B. **Primer/Sealer:** Mildew resistant, as recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Examine substrates and conditions**, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. **Proceed with installation only after** unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. **Comply with manufacturer's written instructions** for surface preparation.
- B. **Clean substrates** of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. **Prepare substrates** to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - 2. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.

- D. **Remove hardware and hardware accessories**, electrical plates and covers, light fixture trims, and similar items.
- E. **Acclimatize acoustic wall-covering materials** by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 ACOUSTIC PANEL INSTALLATION

- A. **Comply with panel manufacturers' written installation instructions** applicable to products and applications indicated.
- B. **Install panels** without lifted or curling edges and without visible shrinkage.
- C. **Trim edges and seams** for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.
- D. **Fully bond panels** to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.4 CLEANING

- A. **Remove excess adhesive** at seams, perimeter edges, and adjacent surfaces.
- B. **Use cleaning methods recommended** in writing by panel manufacturer.
- C. **Replace panels** that cannot be cleaned.
- D. **Reinstall hardware** and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION

SECTION 09 9123

PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. **Section includes** painting work, **interior** and **exterior**. Work includes, but is not limited to painting the following:
1. Metal doors, metal door frames, grilles, frames and fire extinguisher cabinet doors.
 2. Interior walls and ceilings.
 3. Interior wood including but not limited to trim, moldings and miscellaneous items.
 4. Work includes field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, plug mold, electric panels, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated.
- B. **Related Sections:**
1. **Legend-Finish** on Drawings for product selections and colors.
 3. **Shop Primers:** Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.
 - a. Unless otherwise specified, shop priming of fabricated components such as architectural woodwork, wood casework and shop-fabricated or factory-built mechanical and electrical equipment or accessories is included under other sections of these specifications.
 - b. Comply with PDCA Standard P15 "Painting of Shop Primed Substrates"
- C. **"Paint"** as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- D. **Gloss and Sheen Definitions** shall determine the equivalency of the desired finish luster when described in the construction documents by a traditional name instead of gloss units due to the wide variance of sheen descriptions available from manufacturer to manufacturer. Gloss shall be determined by ASTM D523 - 08 Standard Test Method for Specular Gloss.
1. **Flat:** Refers to a lusterless or matte finish with a gloss range below 5 units when measured with a 60 degree meter and no more than 10 units measured at an 85 degree meter.
 2. **Low-Sheen:** Refers to a velvet-like finish with a gloss range below 10 units when measured with a 60 degree meter and between 10-35 units measured at an 85 degree meter.
 4. **Satin:** Refers to low-to-medium range finish with a gloss range between 20-35 units when measured with a 60 degree meter and at least 35 units measured at an 85 degree meter.

5. **Semi-Gloss:** Refers to a medium sheen finish with a gloss range between 35-70 units when measured with a 60 degree meter.
 6. **Gloss:** Refers to a high sheen finish with a gloss range between 70-85 units when measured with a 60 degree meter.
 7. **High-Gloss:** Refers to a very high sheen finish with a gloss range more than 85 units when measured with a 60 degree meter.
- E. **Drywall Finishing Levels:** Except where otherwise specified, a Drywall Finishing Level 5 is required on gypsum board substrates scheduled to receive an eggshell or higher sheen. Drywall Finishing Level 4 is acceptable with the use of flat and low-sheen paints, except where critical lighting conditions are determined to be an issue by the Architect.
- F. **Surfaces to be Painted:** Except where natural finish of material is specifically noted as a surface not to be painted, paint all exposed surfaces whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from manufacturer's full range of colors and finishes. Multiple colors will be selected by the Architect for any type of paint system. If colors are not indicated on the drawings, provide for a minimum of 20 percent of the walls to be an accent color.
1. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.
 2. Walls behind scheduled coverings shall receive prime coat.
 3. If it can be seen, *paint it*.
- G. **Following categories of work are not included** as part of field-applied finish work:
1. **Pre-Finished Items:** Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) metal toilet enclosures, pre-finished partition systems, architectural woodwork and casework, elevator entrance doors and frames, elevator equipment, and finished mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets.
 2. **Concealed Surfaces:** Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces and duct shafts.
 3. **Finished Metal Surfaces:** Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.
 4. **Operating Parts:** Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts will not require finish painting.
 5. **Labels:** Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.3 SUBMITTALS

- A. **Product Data:** Submit manufacturer's technical information including Paint label analysis and application instructions for each material proposed for use.
- B. **Sustainability:** For paints and coatings, printed statement of VOC content demonstrating conformance to Utah Air Quality Regulations (R307-361).

- C. **Samples:** Prior to beginning work, review Legend-Finish for colors to be painted. Use representative colors when preparing samples for review. Submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.
1. On 12 inch x 12 inch hardboard, provide two samples of each color and material, with texture to simulate actual conditions. Resubmit samples as requested by Architect until acceptable sheen, color, and texture is achieved.
 2. On actual wood surfaces, provide two 4 inch x 8 inch samples of natural and stained wood finish. Label and identify each as to location and application.
 3. On actual wall surfaces and other exterior and interior building components, duplicate painted finishes of prepared samples. Refer to "Mockups" below.

1.4 QUALITY ASSURANCE

- A. **Single Source Responsibility:** Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.
- B. **Coordination of Work:** Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.
- C. **Mockups:** Apply full-coat mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Simulate finished lighting conditions for review of in-place work.
1. Architect will select one surface, except as noted below, to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
 - b. Other Items: Architect will designate items or areas required.
 - c. Masonry to Receive Clear Coat: Provide free-standing samples of honed masonry, 48 inches x 48 inches for initial review of clear coat.
 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color/sheen selections are not approved, apply additional mockups of additional colors/sheens selected by Architect at no added cost to Owner.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY AND STORAGE

- A. **Deliver materials** to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:
1. Name or title of material.
 2. Federal Specification number, if applicable.
 3. Manufacturer's batch number and date of manufacture.
 4. Manufacturer's name.
 5. Contents by volume, for major pigment and vehicle constituents.
 6. Thinning instructions.
 7. Application instructions.
 8. Color name and number.

- B. **Store materials** not in actual use in tightly covered containers. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

1.6 PROJECT CONDITIONS

- A. **Apply water-based paints** only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F and 90 degrees F, unless otherwise permitted by paint manufacturer's printed instructions.
- B. **Apply solvent-thinned paints** only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F and 95 degrees F, unless otherwise permitted by paint manufacturer's printed instructions.
- C. **Do not paint in snow, rain, fog or mist**, or when relative humidity exceeds 85 percent, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.
 - 1. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.
- D. **Determine moisture content of surfaces** to be painted by performing appropriate tests using a commercially available moisture meter. Apply paint only when surfaces are within limits specified by the paint manufacturer's printed instructions.

1.7 MAINTENANCE MATERIALS

- A. **Furnish extra materials** that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gallon of each material and color applied.
 - 2. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. **Basis of Design Manufacturer:** Contract Documents are based on products specified in Part 3 Schedules to establish a standard of quality. Other acceptable manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
 - 1. Manufacturer: Sherwin-Williams Company.

- B. **Acceptable Manufacturers:** Subject to compliance with requirements of Contract Documents, provide products by one of the following manufacturers.
1. PPG Industries, Pittsburgh Paints.
 2. The Sherwin-Williams Company (S-W).
 3. Benjamin Moore & Co.

2.2 MATERIALS

- A. **Low-Emitting Materials - VOC Content** (Utah Administrative Code R307-361): Products shall comply with VOC limits of authorities having jurisdiction and, for interior and exterior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24)].
1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 100 g/L.
 3. Dry-Fog Coatings: 150 g/L.
 4. Primers, Sealers, and Undercoaters: 100 g/L.
 5. Industrial maintenance Coatings Applied to Ferrous Metals: 250 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 7. Pretreatment Wash Primers: 420 g/L.
 8. Floor Coatings Foot Traffic: 100 g/L.
 9. Floor Coatings High Performance: 250 g/L.
 10. Shellacs, Clear: 730 g/L.
 11. Shellacs, Pigmented: 550 g/L.
 12. Wood Coatings: 275 g/L.
- B. **Material Quality:** Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.
- C. **Proprietary names** used to designate color or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.
- D. **Federal Specifications** establish minimum acceptable quality for paint materials. Provide written certification from paint manufacturer that materials provided meet or exceed these minimums.
- E. **Manufacturer's products** which comply with coating qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to Architect. Furnish material data and manufacturer's certificate of performance to Architect for any proposed substitutions.
- F. **Color Pigments:** Pure, non-fading, applicable types to suit substrates and service indicated.
- G. **Lead content in pigment**, if any, is limited to contain not more than 0.009 percent lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.
1. This limitation is extended to interior surfaces and those exterior surfaces, such as stairs, decks, porches, railings, windows, and doors which are readily accessible to children under seven years of age.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Applicator must examine areas** and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.
 - 1. Comply with PDCA Standard P4 "Responsibility for Inspection and Acceptance of Surfaces prior to Painting and Decorating"
- B. **Starting of painting work** will be construed as Applicator's acceptance of surfaces and conditions within any particular area.
- C. **Do not paint over dirt**, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.2 PREPARATION

- A. **General:** Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
- B. **Barrier Coats:** Provide barrier coats over incompatible primers or remove and re-prime as required. Notify Architect in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
- C. **Accessories Removal:** Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
- D. **Surface Preparation:** Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.
- E. **Ferrous Metals:** Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.
 - 1. Caulk fabrication joints in hollow metal door frames which paint application cannot bridge.
 - 2. Follow manufacturer's surface preparation recommendations for ferrous metal substrates, ranging from one of the following procedures:
 - a. SSPC-SP 1 - Solvent Cleaning (Nov-04)
 - b. SSPC-SP 2 - Hand Tool Cleaning (Nov-04)
 - c. SSPC-SP 3 - Power Tool Cleaning (Nov-04)
 - d. SSPC-SP 5/NACE No. 1 - White Metal Blast Cleaning (Jan-07)
 - e. SSPC-SP 6/NACE No. 3 - Commercial Blast Cleaning (Jan-07)
 - f. SSPC-SP 7/NACE No. 4 - Brush-Off Blast Cleaning (Jan-07)

- g. SSPC-SP 8 - Pickling (Nov-04)
- h. SSPC-SP 10/NACE No. 2 - Near-White Metal Blast Cleaning (Jan-07)
- i. SSPC-SP 11 - Power Tool Cleaning to Bare Metal (July-12)
- j. SSPC-SP 14/NACE No. 8 - Industrial Blast Cleaning (Jan-07)
- k. SSPC-SP 15 - Commercial Grade Power-Tool Cleaning (July-12)
- l. SSPC-SP 16 - Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals (Apr-10)

- G. **Touch-up:** Touch-up shop-applied prime coats wherever damaged or bare, where required by other sections of these specifications. Clean and touch-up with same type shop primer.
- H. **Galvanized Surfaces:** Clean free of oil and surface contaminants with non-petroleum based solvent. Comply with best practices specified in ASTM D6386 - 10 "Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting."
- I. **Materials Preparation:**
 - 1. Mix and prepare painting materials in accordance with manufacturer's directions.
 - 2. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
 - 3. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.3 APPLICATION

- A. **General:** Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
 - 1. Paint colors, surface treatments, and finishes, are indicated in "schedules" of the contract documents.
 - 2. Provide finish coats which are compatible with prime paints used.
 - 3. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 - 4. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.
 - 5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
 - 6. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.
 - 7. Finish doors on tops, bottoms and side edges same as faces, unless otherwise indicated.
 - 8. Sand lightly between each succeeding enamel or varnish coat.
 - 9. Omit first coat (exterior faces) of surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

- B. **Scheduling Painting:** Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. **Re-coat Time:** Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
 2. **Minimum Coating Thickness:** Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.
- C. **Mechanical and Electrical Work:** Painting of mechanical and electrical work is limited to those items exposed to mechanical equipment rooms and in occupied spaces.
1. Mechanical items to be painted include, but are not limited to, the following:
 - a. Piping, pipe hangers, and supports.
 - b. Roof mounted mechanical units.
 - c. Ductwork, where exposed in occupied spaces.
 - d. Motor, mechanical equipment, and supports.
 - e. Accessory items.
 2. Electrical items to be painted include, but are not limited to, the following:
 - a. Conduit and fittings.
- D. **Prime Coats:** Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others.
1. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- E. **Pigmented (Opaque) Finishes:** Completely cover to provide an opaque, smooth 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.
- F. **Completed Work:** Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.4 FIELD QUALITY CONTROL

- A. **Owner will engage services of an independent testing laboratory** to sample paint being used. Samples of materials delivered to project site will be taken, identified and sealed, and certified in presence of Contractor.
1. Testing laboratory will perform appropriate tests for any or all of following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative materials analysis.
- B. **If test results show** that material being used does not comply with specified requirements, Contractor may be directed to stop painting work, and remove non-complying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are non-compatible.

3.5 CLEAN-UP AND PROTECTION

- A. **Clean-Up:** During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.
1. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- B. **Protection:** Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
1. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
 2. At completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

3.6 INTERIOR PAINT SCHEDULE

- A. **General:** Provide the following paint systems for the various substrates as indicated below or equivalent system from approved manufacturers listed above.
- B. **Metal** - (Interior Structural Steel - Columns, Joists, Trusses, Beams - Misc. & Ornamental Iron, Doors, Door Frames, Non-Galvanized Metal)

Sherwin-Williams - Latex (100% Acrylic) Systems

1st Coat: S-W Pro Industrial Pro-Cry Universal Primer B66-310 Series

Finish: Low sheen.

Thickness: (Mils per coat) 5 - 10 wet; 2 - 4 dry.

VOC: Less than 100 g/L

2nd Coat: S-W Pro Industrial Zero VOC Acrylic Gloss, B66-600 Series

3rd Coat: S-W Pro Industrial Zero VOC Acrylic Gloss, B66-600 Series

Finish: Gloss

Thickness: (Mils per coat) 6 - 12 wet; 2.5 - 4 dry.

C. **Gypsum Board** (Walls, etc.)

Sherwin-Williams - Vinyl Acrylic Systems

1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer,
B28W02600 Series.

Finish: Flat

Sheen (at 85 degrees): 0 - 5 units.

Thickness: (Mils per coat) 4 wet; 1.5 dry.

VOC: 0 g/L

2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss,
B31-2600 Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss,
B31-2600 Series

Finish: Semi-Gloss

Sheen (at 60 degrees): 25 - 35 units

Thickness: (Mils per coat) 4 wet; 1.6 dry.

VOC: 0 g/L

D. **Gypsum Board** (Interior Graphics, Deep Tone Accents, Special Features, Etc.)

Sherwin-Williams - Vinyl Acrylic

1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer,
B28W2600 Series

Finish: Flat

Sheen (at 85 degrees): 0 - 5 units

Thickness: (Mils per coat) 4 wet; 1.5 dry.

VOC: 0 g/L

2nd Coat: S-W ProMar 200 Zero VOC Semi-Gloss B31-2600
series

3rd Coat: S-W ProMar 200 Zero VOC Semi-Gloss B31-2600
series

Sheen (at 60 degrees): 25 - 35 units.

Thickness (Mils per coat): 4 wet; 1.6 dry.

VOC: 0 g/L

E. **Gypsum Board** (Interior behind Wall Panels, Casework etc.)

Sherwin-Williams - Vinyl Acrylic

1st Coat: S-W ProMar 200 Zero VOC Interior Latex Wall
Primer, B28W2600 Series.

Finish: Flat

Sheen (at 85 degrees): 0 - 5 units

Thickness: (Mils per coat) 4 wet - 1.5 dry.

VOC: 0 g/L

END OF SECTION

DIVISION 10 - SPECIALTIES

Section 10 1000	Visual Display Boards
Section 10 2113.19	Plastic Toilet Compartments
Section 10 2600	Wall/Corner Guards
Section 10 2800	Toilet and Bath Accessories
Section 10 5113	Metal Lockers

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SECTION 10 1100

VISUAL DISPLAY BOARDS

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 types of visual display boards:
 - 1. Porcelain enamel marker boards.
 - 2. Vinyl-faced cork tack boards.
- B. **Related Sections:** The following sections contain requirements that relate to this section:
 - 1. Section 06 1053 "**Miscellaneous Rough Carpentry**" for wood blocking and grounds.

1.3 SUBMITTALS

- A. **Product Data:** Product data for each type of marker board and tack board specified, including manufacturer's specifications and installation instructions, details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. **Shop Drawings:** Provide shop drawings for each type of marker board, and tack board required. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
- C. **Samples:** Provide the following samples of each product for selection of colors, patterns, and textures, as required, and for verification of compliance with requirements indicated.
 - 1. Samples for selection of color, pattern, and texture:
 - a. Porcelain Enamel Marker Board: Manufacturer's color charts consisting of actual sections of porcelain enamel finish showing the full range of colors available for each type of marker board required.
 - b. Vinyl-fabric-faced Cork Tack Boards: Manufacturer's color charts consisting of actual sections of vinyl fabric, showing the full range of colors, textures, and patterns available for each type of vinyl-fabric-faced cork tack board indicated.
 - c. Aluminum Trim and Accessories: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate, showing the full range of colors available.
- D. **Certificates:** In lieu of laboratory test reports, when permitted by the Architect, submit the manufacturer's certification that vinyl-fabric-faced cork tack board materials furnished comply with requirements specified for flame spread ratings.

1.4 QUALITY ASSURANCE

- A. **Fire Performance Characteristics:** Provide vinyl-fabric-faced tack boards with surface burning characteristics indicated below, as determined by testing assembled materials composed of facings and backings identical to those required in this section, in accordance with ASTM E 84, by a testing organization acceptable to authorities having jurisdiction.
1. Flame Spread: 25 or less.
 2. Smoke Developed: 10 or less.
- B. **Design Criteria:** The drawings indicate sizes, profiles, and dimensional requirements of visual display boards and bulletin boards. Other visual display boards having equal performance characteristics with deviations from indicated dimensions and profiles may be considered, provided deviations do not change the design concept or intended performance. The burden of proof of equality is on the proposer.

1.5 PROJECT CONDITIONS

- A. **Field Measurements:** Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.
1. Allow for trimming and fitting wherever taking field measurements before fabrication might delay the Work.

1.6 WARRANTY

- A. **Porcelain Enamel Chalkboard Warranty:** Furnish the manufacturer's written warranty, agreeing to replace porcelain enamel chalkboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking, provided the manufacturer's instructions with regard to handling, installation, protection, and maintenance have been followed.
1. Warranty Period: Lifetime of the building.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Available Manufacturers:** Subject to compliance with requirements of Contract Documents, manufacturers offering products may be incorporated in the work include, but are not limited to, the following:
1. Best-Rite Chalkboard Co.
 2. Claridge Products and Equipment, Inc.
 3. ADP/Lemco, Inc.
 4. Inwest Manufacturing.
 5. LBI/Boyd.
 6. Nelson-Adams.
 7. Newline.

2.2 MATERIALS

- A. **Porcelain Enamel Marker Boards:** Provide balanced, high-pressure- laminated porcelain enamel chalkboards of 3-ply construction consisting of face sheet, core material, and backing.
1. **Face Sheet:** Provide face sheet of 24-gage enameling grade steel especially processed for temperatures used in coating porcelain on steel. Coat the exposed face and exposed edges with a 3-coat process consisting of primer, ground coat, and color cover coat, and the concealed face with a 2-coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at the manufacturer's standard firing temperatures.
 - a. **Cover Coat:** Provide the manufacturer's standard light-colored special writing surface with gloss finish intended for use with liquid felt-tipped markers.
 2. **Core:** Provide the manufacturer's standard 3/8-inch-thick particleboard core material complying with the requirements of ANSI A208.1, Grade 1-M-1.
 3. **Backing Sheet:** Provide the manufacturer's standard 0.015-inch- thick aluminum sheet backing.
 4. **Laminating Adhesive:** Provide the manufacturer's standard moisture-resistant thermoplastic-type adhesive.
- B. **Vinyl-Fabric-Faced Tack Boards:** Provide mildew-resistant, washable, vinyl fabric.
1. **Backing:** Make panels rigid by factory laminating cork face sheet under pressure to 1/4-inch-thick hardboard backing.
 2. **Vinyl Facing:** See Color Schedule for vinyl type and color or if not in color schedule as specified by Architect from manufacturer's full range.

2.3 ACCESSORIES

- A. **Metal Trim and Accessories:** Fabricate frames and trim of not less than 0.062-inch-thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure.
1. **General:** Where the size of boards or other conditions exist that require support in addition to the normal trim, provide structural supports or modify the trim as indicated or as selected by the Architect from the manufacturer's standard structural support accessories to suit the condition indicated.
 2. **Field-Applied Trim:** Provide the manufacturer's standard screw-on trim with Phillips flat-head screws.
 3. **Marker Tray:** Furnish the manufacturer's standard continuous, solid extrusion-type aluminum marker tray with ribbed section and smoothly curved exposed ends, for each chalkboard.

2.4 FABRICATION

- A. **Porcelain Enamel Marker Boards:** Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.
- B. **Assembly:** Provide factory-assembled marker board and tack board units, except where field-assembled units are required.
1. Make joints only where total length exceeds maximum manufactured length. Fabricate with the minimum number of joints, balanced around the center of the board, as acceptable to the Architect.
 2. Provide the manufacturer's standard vertical joint system between abutting sections of marker board.
 3. Provide manufacturer's standard mullion trim at joints between marker board and tack board.

2.5 FINISHES

- A. **General:** Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. **Finish:** Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
- C. **Class I, Clear Anodic Finish:** AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.7 mil [0.018 mm] or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. **Deliver** factory-built marker board, tack board and bulletin board units completely assembled in one piece without joints, wherever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, pre-fit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.
- B. **Install** units in locations and at mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.
- C. **Coordinate** job-site assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

3.2 ADJUST AND CLEAN

- A. **Verify** that accessories required for each unit have been properly installed and that operating units function properly.
- B. **Clean units** in accordance with the manufacturer's instructions. Break in marker boards only as recommended by the manufacturer.

END OF SECTION

SECTION 10 2113.19

PLASTIC TOILET COMPARTMENTS

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 toilet compartments** and screens as follows:
 - 1. Type: Solid-plastic, polymer resin.
 - 2. Compartment Style: Overhead braced and floor anchored.
 - 3. Screen Style: Wall mounted.
- B. **Related Sections** include the following:
 - 1. **Legend-Finish** on Drawings for color and pattern selections.
 - 2. Section 10 2800 "**Toilet and Bath Accessories**" for toilet paper holders, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

- A. **Product Data:** For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.
- B. **Shop Drawings:** For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.
- C. **Samples for Selection:** Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment or screen indicated.
- D. **Samples for Verification:** Samples of hardware components, including hinge, latch, and pulls.

1.4 PROJECT CONDITIONS

- A. **Field Measurements:** Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. **Established Dimensions:** Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 PROJECT CONDITIONS

- A. **Maintain environmental conditions** (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

- A. **Manufacturer guarantees** its plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Basis of Design:** Contract Documents are based on product specified below to establish a standard of quality. Other acceptable manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
 - 1. Manufacturer: Scranton Products.
 - 2. Product: "Hiny Hiders".
- B. **Acceptable Manufacturers:** Subject to compliance with requirements of Contract Documents, provide products by one of the following:
 - 1. Bradley "Bradmar"; www.bradleycorp.com
 - 2. Scranton Products, Inc.; www.scrantonproducts.com
 - 3. Accurate Partitions; www.accuratepartitions.com

2.2 MATERIALS

- A. **General:** Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.
- B. **Solid-Plastic, Polymer Resin:** High-density polyethylene (HDPE) with homogenous color throughout. Provide material not less than 1 inch thick with seamless construction and eased edges in color and pattern as follows:
 - 1. Partitions shall be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments. All plastic components shall be covered with a protective plastic masking.
 - 2. Colors and Patterns: Colors and patterns in each room as selected by Architect from manufacturer's full range of colors and patterns.

- C. **Pilaster Shoes and Sleeves (Caps):** ASTM A 666, Type 302 or 304 stainless steel, not less than 0.0312 inch thick and 3 inches high, finished to match hardware.
- D. **Full-Height (Continuous) Brackets:** Manufacturer's heavy-duty extruded aluminum 6063-T5 alloy weighting minimum 1.685 lbs. per lf. of design for attaching panels and screens to walls and pilasters.
- E. **Hardware and Accessories:** Manufacturer's standard design, heavy-duty **Stainless steel** operating hardware and accessories.
- F. **Overhead Bracing:** Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and integral reinforcing channel in manufacturer's standard finish.
- G. **Heat-Sink Strip:** Manufacturer's standard continuous, extruded-aluminum strip in manufacturer's standard finish.
- H. **Anchorage and Fasteners:** Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

- A. **General:** Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.
 - 1. Provide internal reinforcement for compartment-mounted hardware, accessories, and grab bars, as indicated.
- B. **Solid-Plastic, Polymer-Resin Compartments and Screens:** Provide aluminum heat-sink strips at exposed bottom edges of HDPE units to prevent burning.
- C. **Overhead-Braced-and-Floor-Anchored Compartments:** Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.
- D. **Wall-Mounted Screens:** Provide pilasters and panels of same construction and finish as toilet compartments. Continuous brackets, full-height of partition.

- E. **Doors:** Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments indicated to be handicapped accessible.
1. **Hinges:** Self-closing type that can be adjusted to hold door open at any angle up to 90 degrees. Provide full height, continuous Piano Type door hinge of extruded aluminum, 6063-T5, bright anodized finish or Type 304, 16 gauge satin-finish stainless steel. Knuckles shall have nylon separators. Pivot pin shall be 1/4 inch type 304 stainless steel. Hinge shall be predrilled for stainless steel tamper proof bolts, spaced at maximum 8 inches on center. Provide snap on cover over fasteners, attached at top and bottom with theft proof fasteners.
 2. **Latch and Keeper:** Manufacturer's heavy-duty stainless steel surface-mounted latch unit with combination rubber-faced door strike and keeper designed for emergency access. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
 3. **Coat Hook:** Manufacturer's heavy-duty stainless steel combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
 4. **Door Bumper:** Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
 5. **Door Pull:** Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. **General:** Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch between pilasters and panels and not more than 1 inch between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.
- B. **Overhead-Braced-and-Floor-Anchored Compartments:** Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. **Screens:** Attach with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING AND CLEANING

- A. **Hardware Adjustment:** Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.
- B. **Provide final protection** and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 10 2600

CORNER GUARDS

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 types of protection guards:
 - 1. Stainless steel corner guards.

1.3 SUBMITTALS

- A. **Product Data:** Product data for each type of wall and corner guard specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. **Drawings:** Shop drawings detailing fabrication and installation of wall and corner guards. Include plans, elevations, and large-scale details showing layout and types required. Show anchorages and accessory items.

1.4 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** A firm experienced in manufacturing wall and corner guards similar to that indicated for this Project and that has a record of successful in-service performance.

PART 2 - PRODUCTS

2.1 STAINLESS STEEL CORNER GUARDS

- A. **Basis of Design:** Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
 - 1. **Manufacturer:** IPC Door and Wall Protection Systems; Division of InPro Corporation.
 - 2. **Product:** SAS-18112xC-304, 1-1/2 X 1-1/2 x top of wall base to finish ceiling; cement-on style.

- B. **Available Manufacturers:** Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. Arden Architectural Specialties, Inc.
 2. Balco, Inc.
 3. Construction Specialties, Inc.
 4. IPC Door and Wall Protection Systems; Division of InPro Corporation.
 5. Korogard Wall Protection Systems; a division of RJF International Corporation.
 6. Pawling Corporation.

2.2 MATERIALS

- A. **Stainless Steel:** Type 304, 16 gauge; No. 4 satin finish; meeting NSF Standard 51.
- B. **Adhesive:** As recommended by corner guard manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. **General:** Coordinate installation of corner guards indicated to be attached to concrete or masonry, and furnish anchoring devices with templates, diagrams, and instructions for their installation.
1. Coordinate delivery of anchoring devices to Project site to avoid delaying progress.

3.2 INSTALLATION

- A. **General:** Comply with manufacturer's detailed instructions for installing wall and corner guards. Install wall surface protection units plumb, level, and true to line without distortions.
- B. **Installation of Corner Guards:**
1. Surface must be dry, clean and properly sealed.
 2. Cement on: Apply a bead heavy duty adhesive in a zigzag pattern over the back of each wing of the corner guard. Position corner guard on the wall and apply pressure until a tight fit is achieved.
 3. Remove the protective plastic covering from the exposed surface of the corner guard.

3.3 ADJUST AND CLEAN

- A. **After installation,** restore marred, abraded surfaces to the original condition.

END OF SECTION

SECTION 10 2600

WALL/CORNER GUARDS

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** vinyl corner guards.

1.3 SUBMITTALS

- A. **Product Data:** For each type of wall and corner guard specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. **Shop Drawings:** Detailing fabrication and installation of wall and corner guards. Include plans, elevations, and large-scale details showing layout and types required. Show anchorages and accessory items.

1.4 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** A firm experienced in manufacturing wall and corner guards similar to that indicated for this Project and that has a record of successful in-service performance.
- B. **Design Criteria:** The drawings indicate sizes, profiles, and dimensional requirements of the various items of wall and corner guards and are based on the specific types and models indicated. Similar equipment by other manufacturers may be considered, provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

PART 2 - PRODUCTS

2.1 VINYL CORNER GUARDS

- A. **Basis of Design:** Contract Documents are based on system specified below to establish a standard of quality. Other acceptable manufacturers with systems having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
 - 1. Manufacturer: Koroseal.
 - 2. Product: "Korogard" G100-Series Corner Guard
- B. **Surface-mounted, vinyl** over continuous retainer; with 90 degree turn to match wall condition. Exposed surfaces shall be free of wrinkling, chipping, discoloration, or other imperfections.
 - 1. Dimensions
 - a. Leg Length: 2 inches
 - b. Angle: 90 degrees.

2. Profile: High-impact vinyl acrylic extrusion locked in place, nominal 0.078 inch thick. Class I/A fire rating, tested in accordance with ASTM E 84.
3. Extrusion: Pebble grain finish, containing antimicrobial agent.
4. Retainer: Continuous retainer along entire length of corner guard, minimum 0.060 inches thick.
 - a. 6063-T6 aluminum (G100).
5. End Caps: Injection-molded unit of color and texture similar to that of Corner Guard.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. **General:** Comply with manufacturer's detailed instructions for installing wall and corner guards.
- B. **Wall/Corner Guards:** Install wall surface protection units plumb, level, and true to line without distortions.
 1. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished work.

3.2 ADJUST AND CLEAN

- A. After installation, **restore marred, abraded surfaces** to the original condition.

END OF SECTION

SECTION 10 2800

TOILET AND BATH 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 toilet and bath accessories** including but not limited to the following:
 - 1. Toilet tissue dispenser.
 - 2. Paper towel dispenser/disposal units
 - 3. Soap dispenser.
 - 4. Mirrors.
 - 5. Grab bars.
 - 6. Sanitary napkin dispenser.
 - 7. Sanitary napkin disposal unit.
 - 8. Under-lavatory guards.
- B. **Related Sections** include the following:
 - 1. Section 06 1053 "**Miscellaneous Rough Carpentry**" for wood blocking in walls.
 - 2. Section 08 8313 "**Mirrored Glass**" for frameless restroom mirrors.
 - 3. Section 09 2216 "**Non-Structural Metal Framing**" for metal strap blocking in walls.

1.3 SUBMITTALS

- A. **Product Data:** Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
- B. **Samples:** For each accessory item to verify design, operation, and finish requirements.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. **Setting Drawings:** For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
- D. **Product Schedule:** Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.
- E. **Maintenance Data:** For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE

- A. **Source Limitations:** Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.
- B. **Product Options:** Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.
 - 1. Products of other manufacturers listed in Part 2 with equal characteristics, as judged solely by Architect, may be provided.
 - 2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 COORDINATION

- A. **Coordinate accessory locations** with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. **Deliver inserts** and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Acceptable Manufacturers:** Subject to compliance with requirements of Contract Documents, provide products by the following:
 - 1. Bobrick Washroom Equipment, Inc.
 - 2. Underlavatory Guards:
 - a. Brocar Products, Inc.
 - b. Truebro, Inc.

2.2 MATERIALS

- A. **Stainless Steel:** ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. **Brass:** ASTM B 19, leaded and unleaded flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings.
- C. **Sheet Steel:** ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
- D. **Galvanized Steel Sheet:** ASTM A 653/A 653M, G60.
- E. **Chromium Plating:** ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.
- F. **Baked-Enamel Finish:** Factory-applied, gloss-white, baked-acrylic-enamel coating.

- G. **Mirror Glass:** ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
- H. **Galvanized Steel Mounting Devices:** ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- I. **Fasteners:** Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

- A. **General:** Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- B. **Surface-Mounted Toilet Accessories:** Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
- C. **Recessed Toilet Accessories:** Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.
- D. **Framed Glass-Mirror Units:** Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
 - 1. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.
- E. **Mirror-Unit Hangers:** Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
 - 1. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- F. **Keys:** Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. **Install accessories according to manufacturers' written instructions**, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. **Install grab bars** to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.
- C. **Provide blocking and wall supports for all toilet accessories**, whether provided by Contractor or Owner. Verify locations and requirements of Owner-furnished equipment and provide necessary blocking.

3.2 ADJUSTING AND CLEANING

- A. **Adjust accessories** for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
- B. **Remove temporary labels** and protective coatings.
- C. **Clean and polish** exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

- A. **Toilet Tissue Dispenser:**
 - 1. Basis of Design: Bobrick, B-2888.
 - 2. Type-304 stainless steel with all-welded construction, including dispensing mechanism, inner housing and cam; exposed surfaces shall have satin finish. Front of toilet tissue dispenser door shall be drawn, one-piece, seamless construction. Door shall be secured to cabinet with two rivets and equipped with a tumbler lock keyed like other washroom accessories. Unit shall dispense two standard-core toilet tissue rolls up to 5-1/4 inch diameter (1800 sheets). Extra roll shall automatically drop in place when bottom roll is depleted. Unit shall be equipped with two theft-resistant, heavy-duty, one-piece, molded ABS spindles.
- B. **Combination Towel Dispenser/Waste Receptacle:**
 - 1. Basis of Design: Bobrick B-3942.
 - 2. Semi-recessed convertible paper towel dispenser and waste receptacle shall be Type-304 stainless steel with welded construction; exposed surfaces shall have satin finish. Flange shall be drawn and beveled, one-piece, seamless construction. Door shall be secured to cabinet with a full-length stainless steel piano-hinge and equipped with a semi-concealed tumbler lock keyed like other Bobrick washroom accessories. Paper towel dispenser shall dispense 600 C-fold or 800 multifold paper towels. Removable waste receptacle shall be secured to cabinet with a tumbler lock, have front and side edges of bottom and all top edges hemmed for safe handling, and shall have a minimum capacity of 12 gallons.
- C. **Soap Dispenser**
 - 1. Basis of Design: Bobrick B-822
 - 2. Lavatory-mounted soap dispenser shall dispense commercially marketed all-purpose hand soaps, non-iodine based soaps and do not use alcohol based sanitizers. Piston and spout assembly shall be Type-304 stainless steel with bright polished finish. Spout shall rotate 360 degrees without damage to valve mechanism. Escutcheon shall lock to body with concealed locking mechanism that is opened with special key provided. Piston, spout, and supply-tube assembly shall be removable from top for filling and maintenance. Valve shall be equipped with plastic cylinder, stainless steel spring, U-packing seal, and duckbills. Shank shall accommodate mounting thicknesses up to 4 inches. Translucent, shatter-resistant polyethylene container shall have a capacity of 34 fluid ounces.
- D. **Grab Bar**
 - 1. Product: Bobrick, B-6806 Series; lengths as indicated on the Drawings.
 - 2. Stainless-Steel Nominal Thickness: Minimum 0.05 inch.
 - 3. Mounting: Concealed with manufacturer's standard flanges and anchors.
 - 4. Gripping Surfaces: Manufacturer's standard slip-resistant texture.
 - 5. Outside Diameter: 1-1/2 inches for heavy-duty applications.

E. Sanitary Napkin Vending Unit

1. Basis of Design: Bobrick B-47064 25
2. Semi-recessed sanitary napkin/tampon vendor shall combine two dispensing mechanisms in one cabinet to provide sanitary napkins or tampons at user's option. Mechanical operations; no batteries or electricity required. Dispensing mechanisms shall be pre-set at factory for 25¢ operation, but shall be convertible in the field to allow the change of coin denomination without removing unit from wall. Door shall be furnished with graphics indicating specified coin denomination. Unit shall be Type-304 stainless steel with all-welded construction; exposed surfaces shall have #4 satin finish. Stainless steel skirt shall have satin finish and have 90 degree return on edges; radius on corners complement corners and edges of flange and door. Front of door shall have same degree of arc and match other accessories in the washroom. Radius on corners and edges of flange, skirt, and door shall complement other washroom accessories. Flange shall be drawn, one-piece, seamless construction. Door shall be drawn, 18-gauge (1.2mm), one-piece, seamless construction; secured to cabinet with a full-length stainless steel piano-hinge; and equipped with a stainless steel cable door-swing limiter and two flush tumbler locks keyed like other washroom accessories. Vendor product selection and coin return pushbutton-operation shall be certified ADA-ABA, ICC/ANSI A117.1 compliant by third party (certification available on request) for operation with one hand with less than 5 pounds of force (22.2 N) without tight grasping, pinching or twisting of the wrist. Push-Button coin return shall cancel selection and return coin into product tray. Wrong coins (penny, nickel, dime) shall by-pass mechanisms and drop into product tray. Product tray shall be impact-resistant PC-ABS plastic and provide easy access to dispensed product. Coin Box shall be equipped with a tumbler lock that is keyed differently than door locks. Unit shall not carry brand-name advertising.

F. Sanitary Napkin Disposal Unit

1. Product: Bobrick, B-270.
2. Surface-mounted, seamless exposed walls; self-closing top cover; locking bottom panel with stainless-steel, continuous hinge; and removable, reusable receptacle.

G. Mirror Unit:

1. Basis of Design: Bobrick, B-290 Series.
2. Stainless-Steel, Angle-Framed Mirror: Fabricate frame from minimum nominal 0.05-inch- thick stainless-steel angles, with square corners mitered, welded, and ground smooth.
3. Sizes: As indicated on Drawings.

H. Under-Lavatory Guard: Provide under-lavatory guard where lavatory piping is exposed below the counter and at wall hung lavatories. Under-lavatory guards to comply with the following

1. Insulating Piping Coverings: White, antimicrobial, molded-vinyl covering for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings.

END OF SECTION

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SECTION 10 5113

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. Wardrobe lockers: Double tier: 36 inches H x 18 inches D x 18 inches W, 72 inches overall.
- B. **Related Sections** include the following:
 - 1. Section 06 1050 "**Miscellaneous Carpentry**" for wood furring and grounds.

1.3 SUBMITTALS

- A. **Product Data:** Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker and bench.
- B. **Shop Drawings:** Include plans, elevations, sections, details, and attachments to other Work.
 - 1. Show locker fillers, trim, base, sloping tops, and accessories. Include locker-numbering sequence.
- C. **Samples for Selection:** Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
- D. **Maintenance Data:** For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

- A. **Source Limitations:** Obtain locker units and accessories through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. **Do not deliver lockers until** spaces to receive them are clean, dry, and ready for locker installation.
- B. **Protect lockers** from damage during delivery, handling, storage, and installation.
- C. **Deliver master keys**, control keys, and combination control charts to Owner.

1.6 COORDINATION

- A. **Coordinate size and location** of bases.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Basis of Design:** Contract Documents are based products specified below to establish a standard of quality. Other available manufacturers offering products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as determined by the Architect.
1. Manufacturer: Hadrian, Inc.
 2. Product: Emperor Corridor Lockers.
- B. **Available Manufacturers:** Subject to compliance with requirements of Contract Documents, manufacturers offering products which may be incorporated into the Work include, but are not limited to, the following:
1. GSS Lockers
 2. Hadrian, Inc.
 3. Interior/MEDART.
 4. List Industries, Inc.
 5. Lyon Metal Products, Inc.
 6. Republic Storage Systems Co., Inc.
 7. Penco

2.2 MATERIALS

- A. **Cold-Rolled Steel Sheet:** ASTM A 366/A 366M, matte finish, suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.
- B. **Galvanized Steel Sheet:** ASTM A 653/A 653M, commercial quality, G60 (Z180) coating designation; mill phosphatized; suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.
- C. **Fasteners:** Zinc- or nickel-plated steel, slotless-type exposed bolt heads, and self-locking nuts or lock washers for nuts on moving parts.

2.3 LOCKERS

- A. **Sides and Backs:** No less than 24 gage and should not contain extra unnecessary holes.
1. Edges shall be formed to provide a strong and rigid assembly when bolted or riveted together.
 2. Locker backs shall be flanged at right angles providing a triple thickness of metal at the back corner connections.
 3. Shelves, tops and bottoms shall be interchangeable, not less than 22 gage and formed into a pan with a lip formed front edge.
- B. **Door Frames:** Vertical members shall be not less than 16 gage and formed into a rigid channel 5/8 inch wide exposed frame and 2-7/16 inch side depth.
1. Frame shall be completed by 3 inch high top and bottom cross members of not less than 18 gage formed as an open box channel and welded to the verticals.
 2. Bottom frames' full-width lintel extends back and down to form a rigid box to support the bottom shelf. Both vertical frame members shall be formed to offer a full-length 7/16 inch wide continuous door strike.
 3. Latch vertical member shall include a welded 11 gauge padlock hasp together with a 7/16 inch O.D. air-cushioned rubber bumper. No fasteners shall be exposed on fronts of locker doors and frames.

- C. **Doors:** Double-pan design consisting of a 16 gauge outer panel welded to a 24 gauge inner panel to form a rigid box construction that resists prying.
 - 1. Outer panel shall be double flanged on all four edges and the inner panel single flanged on all four edges.
 - 2. A structural and sound deadening 1 inch cell honeycomb core shall be bonded to the inner surfaces. Door shall be flush with the frame and include a recessed handle and recessed number plate,
 - 3. Doors shall be hinged on the right and swing from left to right.
- E. **Continuous Hinges:** Manufacturer's standard, steel continuous hinge mounted to door and frame.
- F. **Recessed Handle and Latch:** No sliding rods, springs, turn handles or moving latches.
 - 1. 11 gauge security strike welded to the frame's continuous door strike. The lock bolt shall secure itself behind the strike. Access to the secured bolt shall be denied by the full length stop on the door frame and by the top lip of the strike projecting forward and fitting into a slot in the door.

2.4 LOCKS

- A. **Fabricate all lockers** to receive the following locking devices, installed on lockers using security-type fasteners:
 - 1. Locks: Digilock DAK-STV, vertical body, recessed-mount, battery powered lock with pull capable of being set for permanent user or day use mode. Lock uses a user-selected four-digit code. Management access to the lock is provided by an electronic bypass key. Operates with (2) 9-volt batteries.
 - a. Furnish ADA accessible locks with accessible user key.

2.5 LOCKER ACCESSORIES

- A. **Interior Equipment:** Furnish each locker with the following items, unless otherwise indicated:
 - 1. Hooks: Manufacturer's standard zinc-plated, ball-pointed steel. Provide one double-prong ceiling hook, and not fewer than two single-prong wall hooks for single-, and double-tier units. Attach hooks with at least two fasteners.
- B. **Number Plates:** Manufacturer's standard etched, embossed, or stamped, aluminum number plates with numerals at least 3/8 inch high. Number lockers in sequence indicated. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
- C. **Continuously Sloping Tops:** Manufacturer's standard, fabricated from minimum 0.0359-inch- thick steel sheet, for installation over lockers with separate flat tops. Fabricate tops in lengths as long as practicable, without visible fasteners at splice locations, finished to match lockers. Provide fasteners, filler plates, supports, and closures, as follows:
 - 1. Closures: Vertical-end type.
 - 2. Sloped top corner fillers, mitered.
- D. **Recess Trim:** Manufacturer's standard; fabricated from minimum 0.0478-inch- thick steel sheet, minimum 2-1/2-inch face width, and finished to match lockers. Fabricate trim in lengths as long as practicable.
- E. **Filler Panels:** Manufacturer's standard; fabricated from minimum 0.0478-inch- thick steel sheet in an unequal leg angle shape, and finished to match lockers. Provide slip joint filler angle formed to receive filler panel.

- F. **Boxed End Panels:** Manufacturer's standard; fabricated from minimum 0.0598-inch-thick steel sheet, with 1-inch-wide edge dimension, finished to match lockers, and designed for concealing exposed ends of non-recessed lockers.

2.6 FABRICATION

- A. **Unit Principle:** Fabricate each locker with an individual door and frame, individual top, bottom, back, and shelves, and common intermediate uprights separating compartments.
- B. **Knocked-Down Construction:** Fabricate lockers for nominal assembly at Project site.
- C. Fabricate 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. Weld frame members together to form a rigid, one-piece assembly.
 - 1. Form locker-body panels, doors, shelves and accessories from one-piece steel sheet, unless otherwise indicated.
- D. **Riveted Connections:** Provide riveted connections where joining lockers together both at exposed to view and concealed locations. (This is in order to prevent bolted connections from being on the inside of lockers.)

2.7 FINISHES, GENERAL

- A. **Finish all steel surfaces and accessories,** except prefinished stainless-steel and chrome-plated surfaces.
- B. Comply with NAAMM's "**Metal Finishes Manual for Architectural and Metal Products**" for recommendations for applying and designating finishes.
- C. **Protect mechanical finishes** on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. **Appearance of Finished Work:** Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 GALVANIZED STEEL SHEET FINISHES

- A. **Surface Preparation:** Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- B. **Baked-Enamel Finish:** Immediately after cleaning and pretreating, apply manufacturer's standard baked-enamel finish consisting of a thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 1.4 mils on doors, frames, and legs, and 1.1 mils elsewhere.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Examine bases** for suitable conditions where metal lockers are to be installed.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. **Install metal lockers and accessories** level, plumb, rigid, and flush according to manufacturer's written instructions.
- B. **Assemble knocked-down lockers with standard fasteners**, with no exposed fasteners on door faces and face frames.
- C. **Anchor lockers** to floors and walls at intervals recommended by manufacturer, but not more than 36 inches o.c. Install anchors through backup reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.
- D. **Fit exposed connections** of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 1. Attach recess trim to recessed lockers with concealed clips.
 - 2. Attach sloping top units to lockers, with closures at exposed ends.
- E. **Attach boxed end panels** with concealed fasteners to conceal exposed ends of non-recessed lockers.
- F. **Anchor locker benches** to uniformly spaced brackets/pedestals not more than 72 inches apart, and securely fasten to bench top and anchor to masonry base.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. **Adjust doors and latches** to operate easily without binding. Verify that integral locking devices operate properly.
- B. **Clean interior and exposed exterior surfaces** and polish stainless-steel and nonferrous-metal surfaces.
- C. **Protect lockers** from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.
- D. **Touch up marred finishes, or replace locker units** that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

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DIVISION 11 - FURNISHINGS

Not Used

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DIVISION 12 - EQUIPMENT

Section 12 2413

Roller Shades

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SECTION 12 2413

ROLLER SHADES

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**
 - 1. Manual roller shades.
 - 2. Motorized shade operators at conference rooms only.
 - 3. Provide both black-out and semi-opaque shades at conference rooms; semi-opaque only at all other locations.
- B. **Related Sections** include the following:
 - 1. Section 06 1053 "**Miscellaneous Rough Carpentry**" for wood blocking and grounds for mounting roller shades and accessories.
 - 2. **Division 26 Sections** for electrical service and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized shade operation.

1.3 SUBMITTALS

- A. **Product Data:** For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
 - 1. Motorized Shade Operators: Include operating instructions.
 - 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. **Shop Drawings:** Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other Work, operational clearances, and relationship to adjoining work.
 - 1. Motorized Shade Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
 - 2. Wiring Diagrams: Power, system, and control wiring.
- C. **Samples for Verification:**
 - 1. For the following products:
 - a. Shade Material: Not less than 3 inches (80 mm) square, with specified treatments applied. Mark face of material.
 - b. Color Selection: Include similar Samples of accessories involving color selection.
- D. **Product Certificates:** For each type of roller shade product, signed by product manufacturer.

- E. **Product Test Reports:** For each type of roller shade product.
- F. **Qualification Data:** For Installer.
- G. **Maintenance Data:** For roller shades to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining roller shades and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
 - 3. Operating hardware.
 - 4. Motorized shade operator.

1.4 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who has completed installation of roller shades 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. **Source Limitations:** Obtain roller shades through one source from a single manufacturer.
- C. **Fire-Test-Response Characteristics:** Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Resistance Ratings: Passes NFPA 701.
- D. **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.
- E. **Corded Window Covering Product Standard:** Provide roller shades complying with WCMA A 100.1.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. **Deliver shades in factory packages,** marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in a window treatment schedule.

1.6 PROJECT CONDITIONS

- A. **Environmental Limitations:** Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. **Field Measurements:** Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Acceptable Manufacturers:** Subject to compliance with requirements of Contract Documents, provide products by one of the following:
1. Draper Shade & Screen Co., Inc.
 2. Nysan Shading Systems Ltd.
 3. MechoShade

2.2 ROLLER SHADES

- A. **Semi-Opaque Shades**
1. Shade Band Material: PVC-coated polyester.
 2. Material Width: Not less than 96 inches (2440 mm).
 3. Bottom Hem: Straight.
 4. Trim: As indicated by manufacturer's designation for style and color.
 5. Material Openness Factor: Not less than 5 percent.
 6. Material Color: As selected by Architect from manufacturer's full range.
- B. **Audiovisual Light-Blocking Shades:** Designed for eliminating all visible light gaps when shades are fully closed; fabricated from blackout shade band material with fascia and bottom bar extended and formed for light-tight joints among shade components and between shade components and adjacent construction.
1. Shade Material: PVC on fiberglass yarn.
 2. Material Openness Factor: 0 percent (opaque).
 3. Material Color: As selected by Architect from manufacturer's full range.
 4. Side Channels and Perimeter Seals: Manufacturer's standard design, including sill light seal attached to bottom bar, for eliminating light gaps when shades are closed. Trim finish as selected by Architect from manufacturer's full range.
- C. **Rollers:** Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with removable spline fitting integral channel in tube for attaching shade material. Provide capacity for one roller shade band per roller, unless otherwise indicated on Drawings.
- D. **Direction of Roll:** Regular, from back of roller.
- E. **Mounting Brackets:** Galvanized or zinc-plated steel.
- F. **Fascia:** L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated on Drawings; removable design for access.
1. **Dual** roller fascia at conference rooms.
- G. **Top/Back Cover:** L shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.

- H. **Bottom Bar:** Steel or extruded aluminum, with plastic or metal capped ends. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.
- I. **Shade Operation:** Manual; with continuous loop bead chain, clutch, and cord tensioner and bracket lift operator.
 - 1. Position of Clutch Operator: Right side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated on Drawings.
 - 2. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
 - 3. Loop Length: Length required to make operation convenient from floor level.
 - 4. Bead Chain: Nickel-plated metal.
 - 5. Cord Tensioner Mounting: Sill.
 - 6. Operating Function: Stop and hold shade at any position in ascending or descending travel.
- J. **Shade Operation:** Motorized operator (at conference rooms).
- K. **Mounting:** Bottom-up brackets mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.
- L. **Hold-Down Brackets and Hooks or Pins and Side Channels:** Provide manufacturer's standard for fixing shade in place, keeping shade band material taut, and reducing light gaps when shades are not mounted vertically but are at an angle or other conditions where light gaps could occur.

2.3 ROLLER SHADE FABRICATION

- A. **Product Description:** Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.
- B. **Concealed Components:** Non-corrodible or corrosion-resistant-coated materials.
 - 1. Lifting Mechanism: With permanently lubricated moving parts.
- C. **Unit Sizes:** Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 degrees F:
 - 1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch (6 mm) from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
 - 2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- D. **Installation Brackets:** Designed for easy removal and reinstallation of shade, for supporting fascia, roller, and operating hardware and for hardware position and shade mounting method indicated.
- E. **Installation Fasteners:** Not fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

- F. **Color-Coated Finish:** For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- G. **Colors of Metal and Plastic Components Exposed to View:** As selected by Architect from manufacturer's full range, unless otherwise indicated.

2.4 MOTORIZED ROLLER SHADE OPERATORS

- A. **General:** Provide factory-assembled motorized shade operation systems designed for lifting shades of type, size, weight, construction, use, and operation frequency indicated. Provide operation systems of size and capacity and with features, characteristics, and accessories suitable for Project conditions and recommended by shade manufacturer, complete with electric motors and factory-prewired motor controls, remote-control stations, remote-control devices, power disconnect switches, enclosures protecting controls and all operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.
- B. **Standards:** Comply with NFPA 70.
- C. **Control Equipment:** Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6 with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- D. **Electric Motors:** UL-approved or -recognized, asynchronous, totally enclosed, insulated, capacitor-start motors, complying with NEMA MG 1, with thermal overload protection, brake, permanently lubricated bearings, and limit switches; sized by shade manufacturer to start and operate size and weight of shade considering service factor or considering Project's service conditions without exceeding nameplate ratings.
 - 1. Service Factor: According to NEMA MG 1, unless otherwise indicated.
 - 2. Motor Characteristics: Single phase, 110 V, 60 Hz.
 - 3. Motor Mounting: Within manufacturer's standard roller enclosure.
- E. **Position of Motor and Electrical Connection:** Right side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated on Drawings.
- F. **Remote Controls:** Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following devices for remote-control activation of shades:
 - 1. Control Stations: Maintained-contact, three-position, rocker-style, wall switch-operated control station with open, close, and center off functions.
 - a. Color: White.
 - 2. Group Control Stations: Maintained-contact, three-position, rocker-style, wall switch-operated control station with open, close, and center off functions for single-switch group control.
 - a. Color: White.
- G. **Limit Switches:** Adjustable switches, interlocked with motor controls and set to automatically stop shade at fully raised and fully lowered positions.
- H. **Operating Function:** Stop and hold shade at any position.
- I. **Operating Features:** Include the following:
 - 1. Group switching with integrated switch control; single face plate for multiple switch cut-outs.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Examine substrates, areas, and conditions**, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. **Install roller shades level, plumb, square, and true** according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow clearances for window operation hardware.
- B. **Connections:** Connect motorized operators to building electrical system.

3.3 ADJUSTING

- A. **Adjust and balance roller shades** to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. **Clean roller shade surfaces** after installation, according to manufacturer's written instructions.
- B. **Provide final protection** and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure roller shades are without damage or deterioration at time of Substantial Completion.
- C. **Replace damaged roller shades** which cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. **Engage a factory-authorized service representative** to train Owner's maintenance personnel to adjust, operate, and maintain systems. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION

DIVISIONS 13 and 14

Not Used

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DIVISION 21-FIRE SUPPRESSION

Section 21 1313 Fire Sprinkler and Piping

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SECTION 21 1313

FIRE SPRINKLER AND PIPING

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 piping and equipment for the following building systems:
 - 1. Automatic wet-type, Class II for sprinklers.
 - 2. Wet-pipe sprinklers, including piping, valves, specialties.
 - 3. Manual –Dry type-Class I, fire-suppression standpipes.
- B. Related Sections include the following:
 - 1. Division 22 05 29 Hangered Supports.
 - 2. Division 23 21 16 Piping Specialties

1.3 DEFINITIONS

- A. Working Plans: Documents, including drawings, calculations, and material specifications prepared according to NFPA 13 and NFPA 14 for obtaining approval from authorities having jurisdiction.
- B. Authority having Jurisdiction: The building official, and Engineer.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Fire sprinkler heads shall match all sprinklers heads in the existing building.
- B. Design standpipes and sprinklers and obtain approval from authorities having jurisdiction.
- C. Design & install fire protection system for canopies, drive-thru's, etc. requiring dry or glycol loops for freeze protection areas. Coordinate with G.C. and mechanical engineer for locations of loops drops and air compressor locations for maintenance.
- D. Design standpipes and obtain approval from authorities having jurisdiction. Include minimum residual pressures at hydraulically remote outlets according to the following.
 - 1. NPS 1-1/2 Hose Connections: 65 psig.
- E. Design sprinkler piping according to the following and obtain approval from authorities having jurisdiction.
 - 1. Office and Public Areas: Light Hazard.
 - 2. Restaurant Seating Areas: Light Hazard.
 - 3. Kitchen: Ordinary Hazard, Group 1.
 - 4. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
 - 5. Building Service Areas: Ordinary Hazard, Group 1.
 - 6. Electrical Equipment Rooms: Ordinary Hazard, Group 1.

- D. Design fire protection system and alarms using FM (Factory Mutual) Approved equipment, and design in accordance with FM (Factory Mutual) Property Loss Prevention Data.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Pipe and fitting materials and methods of joining for sprinkler and standpipe piping.
 - 2. Valves, including specialty valves, accessories, and devices.
 - 3. Alarm devices. Include electrical data.
 - 4. Hose connections. Include size, type and finish.
 - 5. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish and other pertinent data.
- B. Fire-Hydrant Flow Test Report:
- C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction. Include hydraulic calculations, unless noted otherwise.
- D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13 and NFPA 14. Include "Contractor's Materials and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."
- E. Maintenance Data: For each type of standpipe and sprinkler specialty to include in maintenance manuals specified in Division 1.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has designed and installed sprinkler piping similar to that indicated for this Project and obtained design approval and inspection approval from authorities having jurisdiction. Fire protection contractors pre-approved to submit bids for this project are Firetrol, Fire Engineering, Western Automatic Sprinkler. Other contractors shall submit documentation to the engineer prior to bidding. Allowance of additional contractors shall be by addendum.
- B. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer or Engineering Technician NICET Level III. Base calculations on results of fire-hydrant flow test or the Engineer's water analysis.
- C. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL's "Fire Protection Equipment Directory" and FM's "Figure Protection Approval Guide" and that comply with other requirements indicated.
- D. Standpipe and Sprinkler Components: Listing/approval stamp, label or other marking by a testing agency acceptable to authorities having jurisdiction.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- F. NFPA Standards: Equipment, specialties, accessories, installation and testing complying with the following:
 - 1. NFPA 13-96, "Installation of Sprinkler Systems."
 - 2. NFPA 14-96, "Standpipe and Hose Systems."

3. NFPA 70-96, "National Electric Code."
 4. NFPA 72-96, "National Fire Alarm Code."
- G. International Conference of Building Code Officials codes and standards complying with the following:
1. 2009 International Building Code
 2. 2009 International Fire Code
 3. NFPA 13

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. Sprinkler Cabinets: A supply of spare sprinklers (never less than 6) shall be supplied and located in a cabinet where the temperature does not exceed 100 F. These sprinklers shall correspond to the types and temperature rating of the sprinklers installed on the project. Special sprinkler head wrenches shall be included to correspond to the types of heads provided.

The stock of spare sprinklers shall include all types and ratings installed and shall be as follows:

- a. For systems with not over 300 sprinklers, not less than 6 sprinklers.
- b. For systems with 300 to 1000 sprinklers, not less than 12 sprinklers.
- c. For systems with over 1000 sprinklers, not less than 24 sprinklers.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Specialty Valves and Devices:
 - a. Central Sprinkler Corp.
 - b. Firematic Sprinkler Devices, Inc.
 - c. Globe Fire Sprinkler Corp.
 - d. Grinnell Corp.
 - e. Reliable Automatic Sprinkler Co., Inc.
 - f. Viking Corp.
 2. Water-Flow Indicators and Supervisory Switches:
 - a. Grinnell Corp.
 - b. Potter Electric Signal Co.
 - c. Reliable Automatic Sprinkler Co., Inc.
 - d. Viking Corp.
 - e. Watts Industries, Inc.; Water Products Div.
 3. Sprinkler, Drain and Alarm Test Fittings:
 - a. Central Sprinkler Corp.
 - b. Grinnell Corp.
 - c. Victaulic Co. of America
 4. Sprinkler, Branch-Line Test Fittings:
 - a. Smith Industries, Inc.; Potter-Roemer Div.

5. Sprinkler, Inspector's Test Fittings:
 - a. Grinnell Corp.
 - b. Central Sprinkler.
6. Sprinklers:
 - a. Central Sprinkler Corp., (except "Omega" type sprinklers).
 - b. Firematic Sprinkler Devices, Inc.
 - c. Globe Fire Sprinkler Corp.
 - d. Grinnell Corp.
 - e. Reliable Automatic Sprinkler Co., Inc.
7. Gate Valves:
 - a. American Cast Iron Pipe Co.; Waterous Co.
 - b. Grinnell Corp.
 - c. Nibco, Inc.
 - d. Stockham Valves & Fittings, Inc.
8. Indicator Valves:
 - a. Central Sprinkler, Inc.
 - b. Grinnell Corp.
 - c. Nibco, Inc.
 - d. Victaulic Co. of America.
9. Fire-Protection-Service Valves:
 - a. Central Sprinkler Corp.
 - b. Grinnell Corp.
 - c. Nibco, Inc.
 - d. Victaulic Co. of America
10. Keyed Couplings:
 - a. Grinnell Corp.
 - b. Victaulic Co. of America.
 - c. Central Sprinkler Corp.

2.2 PIPE AND TUBES

- A. Standard-Weight Steel Pipe: ASTM A 53, ASTM A 135, or ASTM A 795; Schedule 40 in NPS 6 and smaller, and Schedule 30 in NPS 8 and larger. Schedule 10 pipe for mains.

2.3 PIPE AND TUBE FITTINGS

- A. Cast-Iron Threaded Flanges: ASME B16.1.
- B. Cast-Iron Threaded Fittings: ASME B16.4.
- C. Steel, Threaded Couplings: ASTM A 865.
- D. Steel Welding Fittings: ASTM A 234/A 234M, ASME B16.9, or ASME B16.11.
- E. Steel Flanges and Flanged Fittings: ASME B16.5.
- F. Steel, Grooved-End Fittings: UL-listed and FM-approved, ASTM A 47, malleable iron or ASTM A 536, ductile iron; with dimensions matching steel pipe and ends factory grooved according to AWWA C606.

2.4 JOINING MATERIALS

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for pipe-flange gasket materials and welding filler metals.
- B. Steel, Keyed Couplings: UL 213 and AWWA C606, for steel-pipe dimensions. Include ASTM A 536, ductile-iron housing, rubber gaskets, and steel bolts and nuts. Include listing for dry-pipe service for coupling for dry piping.

2.5 GENERAL-DUTY VALVES

- A. Refer to Division 15 Section "Valves" for gate, ball, butterfly, globe, and check valves not required to be UL listed and FM approved.

2.6 FIRE-PROTECTION-SERVICE VALVES

- A. General: UL listed and FM approved, with minimum 175-psig nonshock working-pressure rating. Valves for grooved-end piping may be furnished with grooved ends instead of type of ends specified.
- B. Gate Valves, NPS 2 and Smaller: UL 262; cast-bronze, threaded ends, solid wedge; OS&Y; and rising stem.
- C. Indicating Valves, NPS 2-1/2 and Smaller: UL 1091; butterfly or ball-type bronze body with threaded ends; and integral indicating device.
 - 1. Indicator: Electrical prewired, supervisory switch. Coordinate voltage and number of circuits with Fire Alarm requirements.
- D. Gate Valves, NPS 2-1/2 and Larger: UL 262, iron body, bronze mounted, taper wedge, OS&Y, and rising stem. Include replaceable, bronze, wedge facing ranges and flanged ends.
- E. Swing Check Valves, NPS 2 and Smaller: UL 312 or MSS SP-80, Class 150; bronze body with bronze disc and threaded ends.
- F. Swing Check Valves, NPS 2-1/2 and Larger: UL 312, cast-iron body and bolted cap, with bronze disc or cast-iron disc with bronze-disc ring and flanged ends.

2.7 SPECIALTY VALVES

- A. Alarm Check Valves: UL 193, 175-psig working pressure; designed for horizontal or vertical installation, with cast-iron flanged inlet and outlet, bronze grooved seat with O-ring seals, and single-hinge pin and latch design. Include trim sets for bypass, drain, electric sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.
 - 1. Option: Grooved-end connections for use with keyed couplings.
 - 2. Drip Cup Assembly: Pipe drain without valves, and separate from main drain piping.

2.8 SPRINKLERS

- A. Automatic Sprinkler: With heat-responsive element complying with the following:
 - 1. NFPA 13
- B. Sprinkler Type and Categories: "Ordinary" temperature classification rating, unless otherwise indicated or required by application. Areas of light hazard occupancy shall be of the quick response type.

1. Orifice: ½ inch with discharge coefficient K between 5.3 and 5.8.
 2. Orifice: 17/32 inch with discharge coefficient K between 7.4 and 8.2.
- C. Sprinkler types, features, and options include the following:
1. Semi-recessed and concealed ceiling sprinklers to match Phase I building sprinklers.
 2. Extended-coverage sprinklers.
 3. Pendent sprinklers
 4. Pendent, dry-type sprinklers.
 5. Quick-response sprinklers.
 6. Recessed sprinklers, including escutcheon to match Phase I sprinklers.
 7. Sidewall sprinklers.
 8. Sidewall, dry-type sprinklers.
 9. Upright sprinklers.
 10. Sprinklers located in canopies (dry system).
- D. Sprinkler Finishes: match existing building.
- E. Special Coatings: Wax, lead, and corrosion-resistant paint.
- F. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

2.9 ALARM DEVICES

- A. General: Types matching piping and equipment connections.
- B. Water-Motor-Operated Alarms: UL 753, mechanical-operation type with pelton-wheel operator with shaft length, bearings and sleeve to suit wall construction and 10-inch-diameter, cast-aluminum alarm gong with red-enamel factory finish. Include NPS ¾ inlet and NPS 1 drain connections.
- C. Water-Flow Indicators: UL 346; electrical-supervision, vane-type water-flow detector, with 250-psig pressure rating; and designed for horizontal or vertical installation. Include two single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed. For wet system only.
- D. Pressure Switches: UL 753; electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow. For dry system only.
- E. Valve Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled valve is in other than fully open position.
- F. Indicator-Post Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled indicator-post valve is in other than fully open position.

2.10 PRESSURE GAGES

- A. Pressure Gages: UL 393, 3-1/2- to 4-1/2-inch- diameter dial with dial range of 0 to 250 psig.

2.11 COORDINATION

- A. All work of this contractor will be coordinated with other trades to insure minimal changes to the sprinkler system from the designs. Careful coordination of mechanical and electrical ducts, pipe and conduit shall be required.
- B. The ceiling plenum must be carefully reviewed and coordinated with all trades. In the event of conflict, the installation of the mechanical equipment and piping shall be in the following order: plumbing waste, rainwater, and soil lines; supply, return, and exhaust ductwork, water piping, fire protection piping.
- C. All piping shall be run concealed where possible. All lines will be run as high as possible so as to not interfere with future changes to ceiling heights or other mechanical equipment. This contractor will be responsible for all sleeves, core drills, and sealing of penetrations in walls, floors and structural members to facilitate the installation of the system.

2.12 VALVE APPLICATIONS

- A. Indicate valve types to be used. The following requirements apply:
 - 1. Fire-Protection-Service Valves: UL listed and FM approved for applications where required by NFPA 13 and NPFA 14.
 - a. Shutoff Duty: Use gate valves at building entry. Use butterfly valves at other locations.
 - 2. General-Duty Valves: For applications where UL-listed and FM-approved valves are not required by NFPA 13 and NFPA 14.
 - a. Shutoff Duty: Use gate, ball, or butterfly valves.

2.13 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Steel-Piping, Grooved Joints: Use Schedule 40 steel pipe with cut or roll-grooved ends and Schedule 30 or thinner steel pipe with roll-grooved ends; steel, grooved-end fittings; and steel, keyed couplings. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions. Use gaskets listed for dry-pipe service for dry piping.
- C. Dissimilar-Piping-Material Joints: Construct joints using adapters or couplings compatible with both piping materials. Use dielectric fittings if both piping materials are metal. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for dielectric fittings.

2.14 SERVICE-ENTRANCE PIPING

- A. Connect standpipe and sprinkler piping to fire supply piping of size and in location indicated.

2.15 PIPING INSTALLATION

- A. Refer to Division 15 Section for basic piping installation.
- B. Locations and Arrangements: Drawing plans, schematics and diagram indicate general location and arrangement of piping.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- C. Install mechanical sleeve seal at pipe penetrations in basement and foundation walls. .
- D. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.
- F. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections grooved couplings may be used.
- G. Install "Inspector's Test Connections" in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13.
- H. Install sprinkler piping with drains for complete system drainage.
- I. Install drain valves on standpipes.
- J. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building. Install ball drips as needed on dry standpipe for drainage.
- K. Install alarm devices in piping systems.
- L. Hangers and Supports: Comply with NFPA 13 for hanger materials. Install according to NFPA 13 for sprinkler piping and to NFPA 14 for standpipes.
- M. Seismic Protection: Install piping according to NFPA 13 – see Section 22 05 48.
- N. Install piping with grooved joints according to manufacturer's written instructions. Construct rigid piping joints, unless otherwise indicated, or required by NFPA 13 for flexibility in seismic zones.
- O. Install pressure gages on riser. Include pressure gages with connection not less than NPS ¼ and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

2.16 VALVE INSTALLATION

- A. Refer to Division 15 Section "Valves" for installing general-duty valves. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA 13 and NFPA 14, manufacturer's written instructions, and authorities having jurisdiction.
- B. Gate Valves: Install fire-protection-service valves supervised-open, located to control sources of water supply except from fire department connections. Provide permanent identification signs indicating portion of system controlled by each valve.
- C. Alarm Check Valves: Install valves in vertical or horizontal position for proper direction of flow, including bypass check valve and retard chamber drain-line connection. Install valve trim in accordance with the valve manufacturer's appropriate trim diagrams. Install main drain to exterior.

- D. Dry-Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment. Test valve for proper operation. Install main drain to exterior.
 - 1. Air-Pressure Maintenance Devices for Dry-Pipe Systems: Install shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer, pressure ratings with 14- to 60-psig adjustable range; and 175-psig maximum inlet pressure.
 - 2. Install compressed-air supply piping from f.p.c. furnished compressed-air piping system.

2.17 SPRINKLER APPLICATIONS

- A. General: Sprinkler heads shall be of the latest design closed spray type of 165 F unless specified otherwise or required by code. Heads in light hazard of shall be quick response type. Heads shall be a minimum orifice size of 1/2". Temperature rating of heads in elevator shafts shall be 286 F. Extra Large Orifice (ELO) heads shall not be used unless specified. Orifices larger than 1/2" may be used as required by density and spacing demands when specified. Use sprinklers according to the following applications:
 - 1. Rooms without Ceilings: Upright and/or pendent sprinklers. Provide mechanical guards on all heads at or below 7'-0" height above the floor or where damage from room occupant use may occur.
 - 2. Rooms with Suspended Ceilings: Recessed sprinklers.
 - 3. Rooms with Suspended Ceilings: Concealed sprinklers.
 - 4. Wall Mounting: Sidewall sprinklers with recessed escutcheon.
 - 5. Spaces Subject to Freezing: Upright; pendent, dry-type; and sidewall, dry-type sprinklers.
 - 6. Provide freeze proof type automatic sprinkler heads serving loading dock, canopies, unconditioned spaces, areas subject to freezing and in other areas requiring their use.

2.18 SPRINKLER INSTALLATION

- A. Every effort shall be required to insure that the heads form a symmetrical pattern in the ceiling grid, lights, diffusers and grilles. Offsets shall be made in piping to accommodate ductwork in the ceiling. Heads should be symmetrical and all piping run parallel or perpendicular to building lines.
 - 1. In no case shall sprinkler heads be installed closer than approved distances from ceiling obstructions.
 - 2. Automatic sprinkler heads located in corridors shall be in center line of corridor.
- B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers (either glycol loops or compressed air dry system) with water supply from heated space. See architectural plans for locations of all required areas.
- C. Install sprinkler in top and bottom of elevator shafts as required by code.

2.19 LABELING AND IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and NFPA 14 and in Section 22 05 53 "Mechanical Identification."

2.20 FIELD QUALITY CONTROL

- A. Flush, test, and inspect sprinkler piping according to NFPA 13, "System Acceptance" Chapter.
- B. Replace piping system components that do not pass test procedures and retest to demonstrate compliance.
- C. Report test results promptly and in writing to Architect and authorities having jurisdiction.

2.21 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers having paint other than factory finish.

2.22 PROTECTION

- A. Protect sprinkler from damage until Substantial Completion.

2.23 COMMISSIONING

- A. Verify that specialty valves, trim, fittings, controls, and accessories are installed and operate correctly.
- B. Verify that air compressors and their accessories are installed and operate correctly.
- C. Verify that specified tests of piping are complete and that "Material Test Certificates" are complete.
- D. Verify that damaged sprinklers and sprinklers with paint or coating not specified are replaced with new, correct type.
- E. Verify that sprinklers are correct types, have correct finishes and temperature ratings, and have guards as required for each application.
- F. Drain dry-pipe sprinkler piping.
- G. Pressurize and check dry-pipe sprinkler piping air-pressure maintenance devices and air compressors.
- H. Fill wet-pipe sprinkler piping with water.
- I. Adjust operating controls and pressure settings.
- J. Coordinate with fire alarm tests. Operate as required.

2.24 DEMONSTRATION & TESTS

- A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.
- B. All tests will be conducted as required by the local authority having jurisdiction, and in no case less than those required by NFPA standards. As a minimum, piping in the sprinkler system shall be tested at a water pressure at 200 psi for a period of not less two hours, or at 50 psi. Bracing shall be in place, and air shall be removed from the system through

the hydrants and drain valves before the test pressure is applied. No apparent leaks will be permitted on interior or underground piping.

- C. The local jurisdiction having authority shall be notified at least three working days in advance of all tests and flushing. This includes any flushing of undergrounds, hydrostatic testing, or flow testing that may be required.
- D. This contractor shall make all the required tests to the sprinkler system as required by code. He shall be responsible to assure that the Contractor Test Certificates for the overhead and underground work are completed and delivered to the owner's insurance underwriter to assure proper insurance credit.
- E. All tests requiring the witnessing by local authorities will be the responsibility of this contractor. If tests are not run or do not have the proper witness, then they will be run later and all damage caused by the system, or caused in uncovering the system for such test, will be borne by this contractor.
- F. Trip test dry pipe sprinkler system as required by code and authority having jurisdiction.

2.25 WARRANTY

- A. This contractor shall warranty the sprinkler system and all its components for one year from the date of acceptance by the owner. Any costs incurred to extend any warranties of materials to assure this time frame shall be borne by this contractor.

END OF SECTION

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DIVISION 22 - PLUMBING

Section 22 0523	Valves
Section 22 0529	Hangers and Supports
Section 22 0548	Mechanical Sound, Vibration and Seismic Control
Section 22 0553	Mechanical Identification
Section 22 0700	Mechanical Insulation
Section 22 1100	Domestic Water Piping
Section 22 1300	Sanitary Waste and Vent Piping
Section 22 3300	Electric, Domestic-Water Heaters
Section 22 4000	Plumbing Fixtures

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**SECTION 22 05 23
VALVES**

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes valves for building services piping.

1.2 REFERENCES

- A. AGA Z21.22 (American Gas Association) - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.
- B. ASME B16.3 (American Society of Mechanical Engineers) - Malleable Iron Threaded Fittings.
- C. AWS (American Welding Society) - Welding and Brazing Qualifications.
- D. MSS SP-67 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Butterfly Valves.
- E. MSS SP-71 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
- F. MSS SP-78 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Plug Valves, Flanged and Threaded Ends.
- G. MSS SP-80 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Bronze Gate, Globe, Angle and Check Valves.
- H. MSS SP-85 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends.
- I. MSS SP-110 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 SUBMITTALS

- A. Submit product data in accordance with the General Conditions of the Contract.
- B. Product Data: Submit Manufacturers catalog information with valve data and ratings for each service.
- C. Welders Certificate: Include welders certification of compliance with ASME SEC IX., AWS D1.1.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit installation instructions, spare parts lists, exploded assembly views.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.

PART 2 PRODUCTS

2.1 PLUMBING VALVES: all plumbing valves shall be rated for a minimum of 125% of system working pressure and temperature.

2.2 GATE VALVES

- A. Acceptable manufacturers:
 - 1. Bronze and Iron Body Valves: Jenkins, Powell, Stockham, Lunkenheimer, Milwaukee, Red-White, Walworth, Crane, Grinnell, Nibco.
 - 2. Ball Valves: James Bury, Worcester, Jenkins, Milwaukee, Apollo, Powell, Nibco.
 - 3. Butterfly Valves: Centerline, DeZurik, Fisher, Victaulic, Keystone, Grinnell, Flowseal.
 - 4. Gas Cock: Peter, Healy or Crane.
 - 5. Lubricated Plug Valves: Homestead, Nordstrom, Powell, Wallworth.
- B. Up To and Including **3 inches (80 mm)**: MSS SP-80, Class 125, bronze body, bronze trim, rising stem, hand-wheel, inside screw, solid wedge disc, solder or threaded ends.
- C. **2 inches (50 mm)** and Larger: MSS SP-70, Class 125, iron body, bronze trim, outside screw and yoke, hand-wheel, solid wedge disc, flanged ends. Furnish chain-wheel operators for valves **6 inches (150 mm)** and larger mounted over **8 feet (2400 mm)** above floor.

2.3 GLOBE VALVES

- A. Up To and Including **3 inches (80 mm)**: MSS SP-80, Class 125, bronze body, bronze trim, hand-wheel, bronze disc, solder or threaded ends.
- B. **2 inches (50 mm)** and Larger: MSS SP-85, Class 125, iron body, bronze trim, hand-wheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Furnish chain-wheel operators for valves **6 inches (150 mm)** and larger mounted over **8 feet (2400 mm)** above floor.

2.4 BALL VALVES

- A. Construction, **4 inches (100 mm)** and Smaller: MSS SP-110, Class 150, **400 psi** CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends.

2.5 PLUG VALVES

- A. Construction **2-1/2 inches (65 mm)** and Larger: MSS SP-78, **175 psi** CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Furnish lever operator with setscrew.

2.6 BUTTERFLY VALVES

- A. Construction 1-1/2 inches (40 mm) and Larger: MSS SP-67, 200 psi (1380 kPa) CWP, cast or ductile iron body. Nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, infinite position lever handle with memory stop. Furnish gear operators for valves 8 inches (150 mm) and larger, and chain-wheel operators for valves mounted over 8 feet (2400 mm) above floor.

2.7 SWING CHECK VALVES

- A. Up To and Including 3 inches (80 mm):
 - 1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder or threaded ends.
- B. 2 inches (50 mm) and Larger:
 - 1. MSS SP-71, Class 12, iron body, bronze swing disc, renewable disc seal and seat, flanged or grooved ends.

2.8 SPRING LOADED CHECK VALVES

- A. Construction: Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

2.9 WATER PRESSURE REDUCING VALVES

- A. Up to 2 inches (50 mm):
 - 1. Construction: MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded ends.
- B. Over 2 inches (50 mm):
 - 1. Construction: MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.10 RELIEF VALVES

- 1. Construction: AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.
- 2. Construction: AGA Z21.22 certified, bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F (98.9 degrees C), capacity ASME SEC IV certified and labeled.

2.11 GATE VALVES

- A. Acceptable manufacturers:
 - 1. Bronze and Iron Body Valves: Jenkins, Powell, Stockham, Lunkenheimer, Milwaukee, Red-White, Walworth, Crane, Grinnell, Nibco.
 - 2. Ball Valves: James Bury, Worcester, Jenkins, Milwaukee, Apollo, Powell, Nibco.
 - 3. Butterfly Valves: Centerline, DeZurik, Fisher, Victaulic, Keystone, Grinnell, Flowseal.
 - 4. Gas Cock: Peter, Healy or Crane.
 - 5. Lubricated Plug Valves: Homestead, Nordstrom, Powell, Wallworth.

6. Construction: Bronze body, bronze trim, union bonnet, rising stem, hand-wheel, inside screw, solid wedge disc, solder or threaded ends.
- B. Over 2 inches (50 mm):
1. Construction: Iron body, bronze trim, bolted bonnet, rising stem, hand-wheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged or grooved ends.

2.12 GLOBE OR ANGLE VALVES

1. Construction: Bronze body, bronze trim, union bonnet, rising stem and hand-wheel, inside screw with renewable composition disc and bronze seat, solder or threaded ends.
- B. Over 2 inches (50 mm):
1. Construction: Iron body, bronze trim, bolted bonnet, rising stem, hand-wheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, flanged ends.

2.13 BALL VALVES

1. Construction: Bronze, two piece body, stainless steel ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder or threaded ends.

2.14 PLUG VALVES

1. Construction: Bronze body, bronze tapered plug, full port opening, non-lubricated, Teflon packing, threaded ends.
 2. Operator: One plug valve wrench for every ten plug-valves with minimum of one wrench.
- B. Over 2 inches (50 mm):
1. Construction: Cast iron body and plug, full port opening, pressure lubricated, teflon packing, flanged ends.
 2. Operator: Each plug valve with wrench with setscrew.

2.15 BUTTERFLY VALVES

- A. Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer or lug ends, extended neck.
- B. Disc: Aluminum bronze.
- C. Operator: Infinite position lever handle with memory stop.

2.16 SWING CHECK VALVES

1. Construction: Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder or threaded ends.
- B. Over 2 inches (50 mm):
1. Construction: Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends.

2.17 SPRING LOADED CHECK VALVES

- A. Construction: Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer or threaded lug ends.

2.18 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe 2 inches (50 mm) and Under:
 - 1. Ferrous Piping: 150 psig (1034 kPa) malleable iron, threaded.
 - 2. Copper Pipe: Bronze, soldered joints.
- B. Flanges for Pipe Over 2 inches (50 mm):
 - 1. Ferrous Piping: 150 psig (1034 kPa) forged steel, slip-on.
 - 2. Copper Piping: Bronze.
- C. Gaskets: 1/16-inch (1.6 mm) thick preformed neoprene.
- D. Grooved and Shouldered Pipe End Couplings:
 - 1. Housing Clamps: Malleable iron to engage and lock designed to permit some angular deflection, contraction, and expansion.
 - 2. Sealing Gasket: C-shape elastomer composition for operating temperature range from 30 degrees F to 230 degrees F.
- E. Accessories: Steel bolts, nuts, and washers.
- F. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.

2.19 TEMPERATURE-ACTUATED WATER MIXING VALVES

- A. Individual-Fixture, Water Tempering:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Powers; a Watts Industries Co.
 - b. Watts Industries, Inc.; Water Products Div.
 - c. Zurn Plumbing Products Group; Wilkins Div.
 - 2. Standard: ASSE 1070, thermostatically controlled water tempering valve.
 - 3. Pressure Rating: 125 psig minimum, unless otherwise indicated.
 - 4. Body: Bronze body with corrosion-resistant interior components.
 - 5. Temperature Control: Adjustable.
 - 6. Inlets and Outlet: Threaded.
 - 7. Finish: Rough or chrome-plated bronze.
- B. TMV-1 Thermostatic Mixing Valve: Leonard TM-80 thermostatic mixing valve with 1" inlets, 1-1/4" outlet, cold water bypass with volume control/shutoff and cabinet.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify Piping System is ready for installation.

3.2 INSTALLATION

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Install valves with stems upright or horizontal, not inverted.
- C. Use grooved mechanical couplings and fasteners only in accessible locations.
- D. Install unions downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- E. Install ball or butterfly valves for shut-off and to isolate each piece of equipment, part of systems, or vertical risers.
- F. Install globe, ball or butterfly valves for throttling, bypass, or manual flow control services.
- G. Provide spring loaded check valves on discharge of water pumps.
- H. Provide plug valves in natural gas systems for shut-off service.
- I. Provide flow controls in water re-circulating systems as indicated on Drawings.
- J. Use lug end butterfly valves to isolate equipment.
- K. Use **3/4 inch (20 mm)** ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.
- L. Provide check valve for backflow prevention.
- M. Provide access means for each valve. Coordinate access means with General Contractor.
- N. Provide isolation valve at each branch take-off serving two or more fixtures or items of equipment.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Conform to applicable piping specification for hangers and insulation.

END OF SECTION

SECTION 22 05 29 HANGERS AND SUPPORTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes pipe and equipment supports, hangers, anchors, bases sleeves and sealing of work to adjacent construction.

1.2 REFERENCES

- A. ASME B31.9 (American Society of Mechanical Engineers) - Building Services Piping.
- B. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
- C. AWS D1.1 (American Welding Society) - Structural Welding Code.
- D. MSS SP58 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Materials, Design and Manufacturer.
- E. MSS SP69 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Selection and Application.
- F. MSS SP89 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.

1.4 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Manufacturers:
 - 1. B-Line, Fee and Mason, Grinnell, PH.D and Michigan
- B. General:
 - 1. Hangers, and accessories shall be sized with a safety factor of five (5) times the actual load.
 - 2. Hangers for insulated piping shall be oversized to accommodate insulation thickness. Provide with insulation shields with inserts or insulation saddles as required in Section 220700 – Mechanical Insulation.
 - 3. Copper clad hangers shall be used for copper piping systems. Provide heavy density mildew and moisture rot proof felt pad securely attached to the hanger or

5 mil thick polyvinyl chloride coating to prevent contact between the pipe and hanger.

- C. Plumbing Piping – DWV:
1. Conform to ASME B31.9 ASTM F708 MSS SP58 MSS SP69 MSS SP89.
 2. Hangers for Pipe Sizes **1/2 to 1-1/2 inch (13 to 38 mm)**: Carbon steel, adjustable swivel, split ring.
 3. Hangers for Cold Pipe Sizes **2 inches (50 mm)** and Over: Hot Dipped Galvanized, Carbon steel, adjustable, clevis.
 4. Multiple or Trapeze Hangers: Hot dipped galvanized, steel channels with welded spacers and hanger rods.
 5. Wall Support for Pipe Sizes to **3 inches (76 mm)**: Cast iron hook.
 6. Wall Support for Pipe Sizes **4 inches (100 mm)** and Over: Welded hot dipped galvanized steel bracket and wrought hot dipped galvanized steel clamp.
 7. Vertical Support: Hot dipped galvanized steel riser clamp.
 8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 9. Copper Pipe Support: Copper-plated, Carbon-steel adjustable, ring.
- D. Plumbing Piping – Water:
1. Conform to ASME B31.9 ASTM F708 MSS SP 58 MSS SP69 MSS SP89.
 2. Hangers Pipe Sizes **1/2 to 1-1/2 inch (13 to 38 mm)**: Hot dipped galvanized, carbon steel, adjustable swivel, split ring.
 3. Hangers for Cold Pipe Sizes **2 inches (50 mm)** and Over: Hot dipped galvanized, carbon steel, adjustable, clevis.
 4. Hangers for Hot Pipe Sizes **2 to 4 inches (50 to 100 mm)**: Hot dipped galvanized, carbon steel, adjustable, clevis.
 5. Hangers for Hot Pipe Sizes **6 inches (150 mm)** and Over: Adjustable, Hot dipped galvanized, steel yoke, cast iron roll, double hanger.
 6. Multiple or Trapeze Hangers: Hot dipped galvanized, steel channels with welded spacers and hanger rods.
 7. Multiple or Trapeze Hangers for Hot Pipe Sizes **6 inches (150 mm)** and Over: Hot dipped galvanized, steel channels with welded spacers and hanger rods, cast iron roll.
 8. Wall support for pipe sizes to **3 inches (76) mm)**: Cast iron hook.
 9. Wall support for pipe sizes **4 inches (100 mm)** and Over: Welded, hot dipped galvanized, steel bracket and wrought hot dipped galvanized steel clamp.
 10. Wall support for hot pipe sizes **6 inches (150 mm)** and Over: Welded hot dipped galvanized, steel bracket and wrought hot dipped galvanized, steel clamp with adjustable steel yoke and cast iron roll.
 11. Vertical Support: Hot dipped galvanized, steel riser clamp.
 12. Floor support for cold pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 13. Floor support for hot pipe sizes to **4 inches (100 mm)**: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 14. Floor support for hot pipe sizes **6 inches (150 mm)** and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or hot dipped galvanized steel support.
 15. Copper Pipe Support: Copper-plated, Hot Dipped Galvanized, Carbon-steel ring.
- E. Hydronic Piping:
1. Conform to ASME B31.9 ASTM F708 MSS SP58 MSS SP69 MSS SP89.
 2. Hangers for Pipe Sizes **1/2 to 1-1/2 inch (13 to 38 mm)**: Hot Dipped Galvanized, Carbon steel, adjustable swivel, split ring.
 3. Hangers for Cold Pipe Sizes **2 inches (50 mm)** and Over: Hot Dipped Galvanized, Carbon steel, adjustable, clevis.

4. Hangers for Hot Pipe Sizes **2 to 4 inches (50 to 100 mm)**: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes **6 inches (150 mm)** and Over: Adjustable, Hot dipped galvanized, steel yoke, cast iron roll, double hanger.
6. Multiple or Trapeze Hangers: Hot dipped galvanized, steel channels with welded spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes **6 inches (150 mm)** and Over: Hot dipped galvanized, steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to **3 inches (76 mm)**: Cast iron hooks.
9. Wall Support for Pipe Sizes **4 inches (100 mm)** and Over: Welded, hot dipped galvanized, steel bracket and wrought hot dipped galvanized steel clamp.
10. Wall Support for Hot Pipe Sizes **6 inches (150 mm)** and Over: Welded, hot dipped galvanized steel bracket and wrought, hot dipped galvanized, steel clamp with adjustable steel yoke and cast iron roll.
11. Vertical Support: Hot dipped galvanized steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or hot dipped galvanized steel support.
13. Floor Support for Hot Pipe Sizes to **4 Inches (100 mm)**: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or hot dipped galvanized steel support.
14. Floor Support for Hot Pipe Sizes **6 inches (150 mm)** and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or hot dipped galvanized steel support.
15. Copper Pipe Support: Copper-plated, carbon steel ring.

2.2 ACCESSORIES

- A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.3 INSERTS

- A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 FLASHING

- A. Metal Flashing: **26 gage** galvanized steel.
- B. Metal Counterflashing: **22 gage** galvanized steel.
- C. Lead Flashing:
 1. Waterproofing: **5 lb./sq. ft (24.5 kg/sq m)** sheet lead
 2. Soundproofing: **1 lb./sq. ft (5 kg/sq m)** sheet lead.
- D. Flexible Flashing: **47 mil thick** sheet butyl; compatible with roofing.
- E. Caps: Steel, **22 gage (0.8 mm)** minimum; **16 gage (1.5 mm)** at fire resistant elements.

2.5 EQUIPMENT CURBS

- A. Fabrication: Welded 18 gage (1.2 mm) galvanized steel shell and base, mitered 3 inch cant, variable step to match roof insulation, 1-1/2 inch thick insulation, factory installed wood nailer.

2.6 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage (1.2 mm) thick galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed Sleeves for Round Ductwork: Galvanized steel.
- D. Sleeves for Rectangular Ductwork: Galvanized steel or wood.
- E. Fire-Stopping Insulation: Glass fiber type, non-combustible.

PART 3 EXECUTION

3.1 INSTALLATION

3.2 INSERTS

- A. Install inserts for placement in concrete forms.
- B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.3 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as scheduled.
- B. Install hangers with minimum 1/2-inch (13 mm) space between finished covering and adjacent work.
- C. Place hangers within 12 inches (300 mm) of each horizontal elbow.
- D. Use hangers with 1-1/2 inch (38 mm) minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet (1.5 m) maximum spacing between hangers.

- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide copper plated hangers and supports for copper piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.

3.4 EQUIPMENT BASES AND SUPPORTS

- A. Provide reinforced concrete housekeeping pads, minimum 4 thick and extending **6 inches (150 mm)** beyond supported equipment. Refer to Architectural Concrete Specifications.
- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of Steel pipe and fittings. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.5 FLASHING

- A. Provide flexible flashing and metal Counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting **3 inches (75 mm)** minimum above finished roof surface with lead worked **1 inch (25 mm)** minimum into hub, **8 inches (200 mm)** minimum clear on sides with **24 x 24 inches (600 x 600 mm)** sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash, and seal.
- C. Flash floor drains in floors with topping over finished areas with lead, **10 inches (250 mm)** clear on sides with minimum **36 x 36 inch (910 x 910 mm)** sheet size. Fasten flashing to drain clamp device.
- D. Seal floor drains watertight to adjacent materials.
- E. Provide acoustical sound control around ducts and pipes penetrating equipment rooms. Fill openings with fiberglass blanket and caulk each side of opening with non-hardening caulking compound.
- F. Provide curbs for mechanical roof installations **14 inches** minimum high above roofing surface. Flash and counter-flash with sheet metal; seal watertight. Attach counterflashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.
- G. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.6 SLEEVES

- A. Set sleeves in position in forms. Provide reinforcing around sleeves.

- B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- C. Extend sleeves through floors **1 inch** above finished floor level. Caulk sleeves.
- D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- E. Install chrome plated steel escutcheons at finished surfaces.

3.7 SCHEDULES

- A. Install pipe hangers in accordance to IPC Section 308.

END OF SECTION

SECTION 22 0548

MECHANICAL SOUND, VIBRATION, AND SEISMIC CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes vibration isolation. Seismic anchorage for all isolated and non-isolated equipment, ductwork and piping systems furnished and installed under Division 15.
- B. Related Sections:
 - 1. Section 220529 – Hangers and Supports
 - 2. Section 232116 – Piping Specialties: Product requirements for Supports, anchors and piping expansion compensation for placement by this section.
 - 3. Section 233100 – Ducts
 - 4. Section 233300 – Duct Accessories: Product requirements for both solid and flexible duct connectors for duct silencers specified for placement by this section.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide seismic anchorage and bracing for all equipment, ductwork and piping in accordance with the appropriate seismic zone of the 2012 International Building Code.
 - 1. Where required, Supports, anchorage and bracing of all equipment, piping and ductwork, shall be designed by a professional engineer working for the restraint manufacturer and qualified with experiences in the seismic bracing of mechanical systems. The seismic engineer shall establish anchorage requirement specific to the equipment submitted, reviewed and accepted by the Architect/Engineer for the project.
 - 2. Furnished equipment shall meet the requirements of the seismic codes with bases and supports designed to accommodate seismic support.
 - 3. Where Required, Prior to starting mechanical work, contractor is to submit to mechanical engineer seismic details and drawings by a licensed seismic engineer for all equipment requiring seismic restraint. These drawings are to be stamped and signed, and will then be reviewed with engineer and city.
 - 4. Upon completion of the project, the licensing seismic engineer shall perform a walk through of the project site and submit a written observation report to the mechanical engineer and to the city. Contractor shall notify engineer and the city when seismic engineer is to perform site visit.
- B. Provide vibration isolation on motor driven equipment over 0.5 hp (0.35 kW), plus connected piping and ductwork.
- C. Provide minimum static deflection of isolators for equipment as follows:
 - 1. Slab on Grade, Under 20 hp (15 kW)
 - a. Under 400 rpm: Rubber Floor Isolator or Hanger
 - b. 400 – 600 rpm: 1 inch (25 mm)
 - c. 600 - 800 rpm: 0.5 inch (12 mm)
 - d. 800 - 900 rpm: 0.2 inch (5 mm)
 - e. 1100 - 1500 rpm: 0.14 inch (4 mm)
 - f. Over 1500 rpm: 0.1 inch (3 mm)

2. Slab on Grade, Over 20 hp (15 kW)
 - a. Under 400 rpm: Rubber Floor Isolators or Hangers
 - b. 400 - 600 rpm: 2 inch (50 mm)
 - c. 600 - 800 rpm: 1 inch (25 mm)
 - d. 800 - 900 rpm: 0.5 inch (12 mm)
 - e. 1100 - 1500 rpm: 0.2 inch (5 mm)
 - f. Over 1500 rpm: 0.15 inch (4 mm)
 3. Upper Floors, Normal
 - a. Under 400 rpm: Rubber Floor Isolators or Hangers
 - b. 400 - 600 rpm: 3.5 inch (90 mm)
 - c. 600 - 800 rpm: 2 inch (50 mm)
 - d. 800 - 900 rpm: 1 inch (25 mm)
 - e. 1100 - 1500 rpm: 0.5 inch (12 mm)
 - f. Over 1500 rpm: 0.2 inch (5 mm)
- D. Maintain sound level of spaces at levels not to exceed those listed below by utilizing acoustical devices.
- E. Maintain rooms at 35 NC maximum sound levels, in Noise Criteria (NC) as defined by ASHRAE Handbook.

1.3 SUBMITTALS

- A. Submit shop drawings calculations and product data in accordance with the general provisions of the specifications.
- B. Shop Drawings: Indicate inertia bases and locate vibration isolators, with static and dynamic load on each. Indicate assembly, materials, thickness, dimensional data, pressure losses, acoustical performance, layout, and connection details for sound attenuation products fabricated for this project.
- C. Product Data: Submit schedule of vibration isolator type with location and load on each. Submit catalog information indicating, materials and dimensional data.
- D. Design Data: Submit calculations for seismic and vibration requirements for all equipment to be restrained and isolated. Drawings and calculations submitted for seismic bracing and anchors shall bear the engineer's signed professional seal.
- E. Prior to starting mechanical work, contractor is to submit to mechanical engineer seismic details and drawings by a licensed seismic engineer for all equipment requiring seismic restraint. These drawings are to be stamped and signed, and will then be reviewed with engineer and city.
- F. Upon completion of the project, mechanical contractor is to have the licensing seismic engineer perform a walk through of the project site and submit a written observation report to the mechanical engineer and to the city. Contractor shall notify engineer and the city when seismic engineer is to perform site visit.
- G. Manufacturer's Installation Instructions: Submit special procedures and setting dimensions. Indicate installation requirements maintaining integrity of sound isolation.
- H. Manufacturer's Certificate: Certify isolators meet or exceed specified requirements.
- I. Manufacturer's Field Reports: Indicate sound isolation and seismic restraint installation is complete and in accordance with instructions.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with International Building Code (IBC), Smacna Seismic Restraint Manual, AMCA 300 ANSI S1.13 ARI 575 ASA 16 ANSI S1.36 standards and recommendations of ASHRAE 68.
- B. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years [documented] experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.
- C. Design application of seismic restraint systems under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Utah.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 VIBRATION ISOLATORS

- A. Open Spring Isolators:
 - 1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 - 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 - 3. Spring Mounts: Furnish with leveling devices, minimum **0.25 inch (6 mm)** thick neoprene sound pads, and zinc chromate plated hardware.
 - 4. Sound Pads: Size for minimum deflection of **0.05 inch (1.2 mm)**; meet requirements for neoprene pad isolators.
- B. Restrained Spring Isolators:
 - 1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 - 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 - 3. Spring Mounts: Furnish with leveling devices, minimum **0.25 inch (6 mm)** thick neoprene sound pads, and zinc chromate plated hardware.
 - 4. Sound Pads: Size for minimum deflection of **0.05 inch (1.2 mm)**; meet requirements for neoprene pad isolators.
 - 5. Restraint: Furnish mounting frame and limit stops.
- C. Closed Spring Isolators:
 - 1. Spring Isolators:

- a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 - 2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
 - 3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 - 4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch (7 mm) clearance.

- D. Restrained Closed Spring Isolators:
 - 1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 - 2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
 - 3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 - 4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch (7 mm) clearance and limit stops.

- E. Spring Hanger:
 - 1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 - 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 - 3. Housings: Incorporate rubber hanger with threaded insert.
 - 4. Misalignment: Capable of 20 degree hanger rod misalignment.

- F. Neoprene Pad Isolators:
 - 1. Rubber or neoprene-waffle pads.
 - a. 30 durometer.
 - b. Minimum 1/2 inch (13 mm) thick.
 - c. Maximum loading 40 psi (275 kPa).
 - d. Height of ribs: not to exceed 0.7 times width.
 - 2. Configuration: 1/2-inch (13 mm) thick waffle pads bonded each side of 1/4-inch (6 mm) thick steel plate.

- G. Rubber Mount or Hanger: Molded rubber designed for 0.5 inches (13 mm) deflection with threaded insert.

- H. Glass Fiber Pads: Neoprene jacketed pre-compressed molded glass fiber.

- I. Seismic Snubbers:
 - 1. Type: Non-directional and double acting unit consisting of interlocking steel members restrained by neoprene elements.
 - 2. Neoprene Elements: Replaceable, minimum of 0.75 inch (18 mm) thick.
 - 3. Capacity: 4 times load assigned to mount groupings at 0.4 inch (10 mm) deflection.
 - 4. Attachment Points and Fasteners: Capable of withstanding 3 times rated load capacity of seismic snubber.

PART 3 EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION

- A. Install isolation for motor driven equipment.
 - 1. Bases:
 - 2. Set steel bases for **1-inch (25 mm)** clearance between housekeeping pad and base.
 - 3. Set concrete inertia bases for **2-inch (50 mm)** clearance between housekeeping pad and base.
 - 4. Adjust equipment level.
- B. Install spring hangers without binding.
- C. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.
- D. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.
- E. Provide resiliently mounted equipment, piping, and ductwork with seismic snubbers. Provide each inertia base with minimum of four seismic snubbers located close to isolators. Snub equipment designated for post disaster use to **0.05-inch (1.5 mm)** maximum clearance. Provide other snubbers with clearance between **0.15 inch (4 mm)** and **0.25 inch (7 mm)**.
- F. Support piping connections to isolated equipment resiliently as follows:
 - 1. Up to **4 inch (100 mm)** Diameter: First three points of support.
 - 2. **5 to 8 inch (125 to 200 mm)** Diameter: First four points of support.
 - 3. **10 inch (250 mm)** Diameter and Over: First six points of support.
 - 4. Select three hangers closest to vibration source for minimum **1.0-inch (25 mm)** static deflection or static deflection of isolated equipment. Select remaining isolators for minimum **1.0-inch (25 mm)** static deflection or 1/2 static deflection of isolated equipment.
- G. Connect wiring to isolated equipment with flexible hanging loop.

3.3 FIELD QUALITY CONTROL

- A. Quality Requirements: Testing, adjusting, and balancing.
- B. Inspect isolated equipment after installation and submit report. Include static deflections.
- C. After start-up, final corrections and balancing of systems take octave band sound measurements over full audio frequency range in areas adjacent to mechanical equipment rooms, duct and pipe shafts, and other critical locations. Provide one-third octave band measurements of artificial sound sources in areas indicated as having critical requirements. Submit complete report of test results including sound curves.

PIPE ISOLATION SCHEDULE

Pipe Size Inch (mm)	Isolated Distance from Equipment
1 (25)	120 diameters (3.0 m)
2 (50)	90 diameters (4.5 m)
3 (80)	80 diameters (6.0 m)
4 (100)	75 diameters (7.5 m)
6 (150)	60 diameters (9.0 m)
8 (200)	60 diameters (12.0 m)
10 (250)	54 diameters (13.5 m)
12 (300)	50 diameters (15.0 m)
16 (400)	45 diameters (18.0 m)
24 (600)	38 diameters (23.0 m)
Over 24 (600)	

EQUIPMENT ISOLATION SCHEDULE

ISOLATED EQUIPMENT	BASE TYPE THICKNESS	ISOLATOR TYPE DEFLECTION
HVAC Pumps	B/C	2/3
Chillers	A	2
Fans (over 10 H.P.)	C	4

BASE TYPES:

- A = No base, isolators attached directly to equipment
- B = Structural steel rails or base
- C = Concrete inertia base
- D = Curb-mounted base

ISOLATOR TYPES:

- 1 = Rubber or glass fiber pad
- 2 = Rubber floor isolator or hanger
- 3 = Spring floor isolator or hanger
- 4 = Restrained spring isolator
- 5 = Thrust restraint
- 6 = Spring and rubber in series hanger

NOTES:

1. Contractor shall provide vibration isolation and calculations stamped by a licensed professional engineer.
2. To avoid isolator resonance problems, select isolator deflection so that natural frequency is 40% or less than lowest operating speed of equipment (see ASHRAE HVAC applications handbook, 1991 edition).

END OF SECTION

SECTION 22 0553

MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes nameplates, tags, stencils and pipe markers.

1.2 REFERENCES

- A. ASME A13.1 (American Society of Mechanical Engineers) - Scheme for the Identification of Piping Systems.
- B. NFPA 99 (National Fire Protection Association) - Standard for Health Care Facilities.

1.3 SUBMITTALS

- A. Submit product data and shop drawings in accordance with the General Conditions of the Contract.
- B. Product Data: Submit manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Product Description: Laminated three-layer plastic with engraved letters in contrasting background color.

2.2 TAGS

- 1. Brass with stamped letters; tag size minimum **1-1/2 inches** diameter with finished edges. Provide with brass chains for installation.
- B. Information Tags:
 - 1. Clear plastic with printed "Danger," "Caution," or "Warning" and message; size **3-1/4 x 5-5/8 inches (83 x 143 mm)** with grommet and self-locking nylon ties.
- C. Tag Chart: Typewritten letter size list of applied tags and location plastic laminated.

2.3 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:
 - 1. Up to **1 1/4 inches** Outside Diameter of Insulation or Pipe: **1/2 inch**-high letters.
 - 2. 1-1/2 to 2 inches outside diameter of insulation of pipe: **3/4 inch** high letters.
 - 3. **2-1/2 to 6 inches** Outside Diameter of Insulation or Pipe: **1 1/4-inch** high letters.
 - 4. Outside Diameter of Insulation or Pipe: **2 1/2 inches** high letters.
 - 5. Over 10 inches outside diameter of pipe or insulation: **3-1/2 inch** high letters.
 - 6. Ductwork and Equipment: **2-1/2 inches** high letters.
- B. Stencil Paint: As specified in Architectural Painting Specifications, semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

2.4 PIPE MARKERS

- A. Color and Lettering: Conform to ASME A13.1.
- B. Plastic Pipe Markers:
 - 1. Manufacturer:
 - a. Set mark type snap-around markers.
 - 2. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.
- C. Plastic Tape Pipe Markers:
 - 1. Manufacturer:
 - a. Brady Type 350.
 - 2. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings, with legend, size and color coding.

2.5 CEILING TACKS

- A. Description: Steel with **3/4 inch (19 mm)** diameter color-coded head.
- B. Color code as follows:
 - 1. HVAC equipment: Yellow.
 - 2. Fire dampers/smoke dampers: Red.
 - 3. Plumbing valves: Green.
 - 4. Heating/cooling valves: Blue.

2.6 LABELS

- A. Description: Laminated Mylar, size **1.9 x 0.75 inches**, adhesive backed with printed identification.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Architectural Painting Specifications for stencil painting.

3.2 INSTALLATION

- A. Apply stencil painting in accordance with Architectural Painting Specifications.
- B. Install identifying devices after completion of coverings and painting.
- C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- D. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.
- E. Install tags using corrosion resistant chain. Number tags consecutively by location.

- F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Identify in-line pumps and other small devices with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify valves in main and branch piping with tags.
- I. Identify air terminal units and radiator valves with numbered tags.
- J. Tag automatic controls, instruments, and relays. Key to control schematic.
- K. Identify piping, concealed or exposed, with plastic pipe markers, plastic tape pipe markers or stenciled painting. Use tags on piping **3/4 inch (20 mm)** diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed **20 feet (6 m)** on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- L. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

3.3 SCHEDULES

IDENTIFICATION

- | | | |
|----|-----------------------------|--------------------|
| 1. | Domestic Cold Water Piping. | |
| | a. Background Color: | <u>Green</u> |
| 2. | Domestic Hot Water. | |
| | a. Background Color: | <u>Yellow</u> |
| 3. | Hot water Heating. | |
| | a. Background Color: | <u>Yellow</u> |
| | b. With Directional Arrow. | |
| 4. | Natural Gas. | |
| | a. Background Color: | <u>Orange</u> |
| 5. | Ductwork. | |
| | a. Identification Type: | <u>N/A</u> |
| 6. | Chilled Water | |
| | a. Background Color: | <u>Blue</u> |
| | b. With Directional Arrow. | |
| 7. | Cooling Tower | |
| | a. Background Color: | <u>Light Green</u> |
| | b. With Directional Arrow. | |

END OF SECTION

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SECTION 22 0700
MECHANICAL INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes ductwork insulation, duct liner, insulation jackets, covering, and thermal insulation for piping systems including vapor retarders, jackets and accessories.
- B. Related Sections:
 - 1. Section 220529 – Hangers and Supports: Execution requirements for inserts for placement by this section.
 - 2. Section 220523 – Mechanical Identification: Product requirements for mechanical identification for placement by this section.

1.2 REFERENCES

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.
- B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- C. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
- D. ASTM C518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- E. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
- F. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- G. ASTM C547 - Standard Specification for Mineral Fiber Preformed Pipe Insulation.
- H. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.
- I. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- J. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyurethane Thermal Insulation.
- K. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type).
- L. ASTM C610 - Standard Specification for Expanded Perlite Block and Pipe Thermal Insulation.
- M. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

- N. ASTM C1071 - Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).
- O. ASTM C1126- Standard Specification for Preformed Closed Cell Phenolic Foam Pipe and Board Insulation.
- P. ASTM C1136 – Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
- Q. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- R. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- S. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- T. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.
- U. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- V. NAIMA (North American Insulation Manufacturers Association) - National Insulation Standards.
- W. SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards - Metal and Flexible.

1.3 SUBMITTALS

- A. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location, as per the general conditions of the contract.
- B. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Certain-Teed

Owens-Corning

Johns-Manville

Armstrong

Knauf

Dow Chemical

2.2 GLASS MINERAL FIBER, FLEXIBLE BLANKET DUCT WRAP

- A. Insulation: Glass Fiber Blanket Thermal Insulation for Commercial and Industrial Applications. 1 ½" thick .075 pounds per cubic foot with a thermal conductivity of .24 at 75 degrees F.
- B. Vapor Retarder Jacket: ASTM 1136, Type II Flexible and Low Permeance Vapor Retarders for Thermal Insulation. Perm rating shall not exceed .24 when tested in accordance with ASTM E96, Procedure A.
- C. Manufacturers:
 - 1. Manufacturers:
 - Certain-Teed
 - Owens-Corning
 - Johns-Manville
 - Armstrong
 - Knauf
 - Dow Chemical
 - 2. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Indoor Vapor Retarder Finish:

1. Manufacturers:

Certain-Teed

Owens-Corning

Johns-Manville

Armstrong

Knauf

Dow Chemical

2.3 CELLULAR GLASS PIPE INSULATION

A. Insulation: ASTM C552, Type II – pipe and tubing insulation, Class 2 - Jacketed.

1. 'K' ('ksi') factor: ASTM C177 or ASTM C518, 0.25at 75 degrees F.

B. Vapor retarder jacket: Perm rating shall not exceed 0.25 when tested in accordance with ASTM E96, Procedure A.

2.4 PROTECTIVE INSULATION JACKET (PIPE INSULATION EXPOSED TO WEATHER)

A. Aluminum Jacket: ASTM B209.

1. Thickness: 0.016 inch thick sheet.

2. Finish: Smooth.

3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.

4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

2.5 GLASS FIBER DUCT LINER, FLEXIBLE Insulation for Interior of sheet metal ducts.

A. Insulation: ASTM C1071 Thermal and Acoustical Insulation Glass Fiber, Duct Lining Material, Type I

B. Adhesive:

1. Waterproof, ASTM E162 fire-retardant type.

C. Liner Fasteners: Galvanized steel, welded with integral head.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify piping, equipment and ductwork has been tested before applying insulation materials.

B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

- A. Install in accordance with NAIMA National Insulation Standards.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. For hot piping conveying fluids over **110 degrees F**, insulate flanges and unions at equipment.
- D. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- E. Inserts and Shields:
 - 1. Application: Piping or Equipment **1-1/2 inches** diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under finish jacket.
 - 4. Insert configuration: Minimum **6 inches (150 mm)** long, of thickness and contour matching adjoining insulation; may be factory fabricated.
 - 5. Insert material: Compression resistant insulating material suitable for planned temperature range and service.
- F. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section 07840 for penetrations of assemblies with fire resistance rating greater than one hour.
- G. Exterior Applications: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with stainless steel jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal equipment.
- H. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
- I. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
- J. Glass fiber insulated equipment containing fluids above ambient temperature: Provide standard jackets, with or without vapor retarder, factory-applied or field-applied. Finish with glass cloth and adhesive.
- K. Finish insulation at supports, protrusions, and interruptions.
- L. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.
- M. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.
- N. Insulated ductwork conveying air below ambient temperature:

1. Provide insulation with vapor retarder jackets.
 2. Finish with tape and vapor retarder jacket.
 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- O. Duct Liner Application:
1. Adhere insulation with adhesive for 100 percent coverage.
 2. Secure insulation with mechanical liner fasteners. SMACNA Standards for spacing.
 3. Seal and smooth joints. Seal and coat transverse joints.
 4. Seal liner surface penetrations with adhesive.
 5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.
- P. On cold & hot water piping that feeds exterior hose bibs & sill cocks, insulate entire pipe all the to the fixture for freeze protection.
- Q. Install PVC jacket on the interior exposed insulation in the mechanical boiler room and in the mechanical penthouse.
- R. All chilled water and heating water storage tanks are to be insulated with 2" fiberglass insulation cloth coated and sewn with tight seal.

3.3 SCHEDULES

- A. Plumbing Systems:
1. Domestic & Industrial Hot Water Supply and Recirculation Systems:
 - a. Insulate entire system with fiberglass pipe covering with all service jacket and self seal lap. Insulation thickness as follows: 1" thick for all pipe sizes.
 2. Domestic & Industrial Cold Water:
 - a. Horizontal mains and elbows to vertical risers / drops: ½" thick fiberglass pipe covering with all service jacket and self-seal lap.
 3. Primary Roof Drains:
 - a. Horizontal mains and vertical to and including drain bowls with ½ inch thick fiberglass pipe covering with all service jacket and self-seal lap.
 - b. Bowls of secondary roof drains shall be insulated with ½ " thick foil scrim face.
 4. Fittings:
 - a. Pre-molded PVC fitting covers with fiberglass insert. In return air plenums use insulating cement finished with 6-ounce canvas and heavy coat of vapor barrier mastic coating.
- B. Steam piping
1. Insulate all steam piping with a minimum of 2" Calcium Silicate
 2. Conductivity @ 200°F: 0.43 [Btuh · in / (h · ft² · °F)].
 3. Minimum temp: 250; maximum temp: 1000.
- C. Heating System (Supply and Return Piping)
1. Fiberglass pipe covering with all-service jacket and self-seal lap.
 2. Thickness as follows: 1" thick for pipe sizes up to and including 1½". 2" thick for pipes sizes 2" and larger.
 3. Insulate all air separators on all heating systems.

- D. Chilled Water (Supply and Return Piping)
1. Fiberglass pipe covering with all-service jacket and self-seal lap.
 2. Thickness as follows: 1" thick for pipe sizes up to and including 1½". 2" thick for pipes sizes 2" and larger.
 3. Insulate all air separators and the base of all chilled water pumps with 2" fiberglass coated insulation sewn tight.
- E. Air Distribution System:
1. All supply air duct is to be wrapped up to the VAV boxes. Downstream of the VAV boxes, the duct is to be lined if rectangular and wrapped if round. All return air grilles shall have lined sound boots painted flat black
 2. Supply ductwork (not indicated to be lined): 1½" thick .75 pound fiberglass duct wrap with foil scrim facing. Seal all joints. Apply with adhesive or wire at 18" O.C.
 3. Lined supply ductwork.
 - a. Insulate with 1" duct liner with continuous sheet metal edge protector at entering and leaving edges.
 - b. Coat transverse joints prior to installation.
 - c. Line ductwork in rectangular ductwork downstream of VAV or fan terminal boxes, upstream of toilet exhaust fans a minimum distance of 10'-0", transfer air ducts and supply plenums above air devices.
 - d. Pipe insulation exposed to weather.
- F. Provide aluminum jacket and fitting covers on all piping exposed to weather

END OF SECTION

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SECTION 22 1100

DOMESTIC & INDUSTRIAL WATER PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes domestic & industrial water piping, valves, fittings, hangers, pumps, water softeners, controls and accessories.
- B. Related Sections:
 - 1. Section 220529: Hangers and Supports.
 - 2. Section 220548 – Mechanical Sound, Vibration, and Seismic Control: Product requirements for vibration isolators for placement by this section.
 - 3. Section 220700 – Mechanical Identification: Product requirements for pipe identification and valve tags for placement by this section.

1.2 REFERENCES

- A. ASME B16.1 (American Society of Mechanical Engineers) - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.
- B. ASME B16.18 (American Society of Mechanical Engineers) - Cast Copper Alloy Solder Joint Pressure Fittings.
- C. ASME B16.22 (American Society of Mechanical Engineers) - Wrought Copper and Bronze Solder Joint Pressure Fittings.
- D. ASME B16.26 (American Society of Mechanical Engineers) - Cast Bronze Fittings for Flared Copper Tubes.
- E. ASME B31.9 (American Society of Mechanical Engineers) - Building Service Piping.
- F. ASTM B32 - Solder Metal.
- G. ASTM B42 - Seamless Copper Pipe.
- H. ASTM B88 - Seamless Copper Water Tube (ASTM B88M - Seamless Copper Water Tube [Metric]).
- I. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
- J. AWS A5.8 (American Welding Society) - Brazing Filler Metal.
- K. AWWA C651 (American Water Works Association) - Disinfecting Water Mains.
- L. MSS SP58 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Materials, Design and Manufacturer.
- M. MSS SP-67 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Butterfly Valves.

- N. MSS SP69 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Selection and Application.
- O. MSS SP-70 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Gate Valves, Flanged and Threaded Ends.
- P. MSS SP-71 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
- Q. MSS SP-78 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Plug Valves, Flanged and Threaded Ends.
- R. MSS SP-80 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Bronze Gate, Globe, Angle and Check Valves.
- S. MSS SP-85 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends.
- T. MSS SP89 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Fabrication and Installation Practices.
- U. MSS SP-110 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
- V. UL 1479 (National Fire Protection Association) - Fire Tests of Through-Penetration Firestops.
- W. ASME A1126.1 (American Society of Mechanical Engineers) - Water Hammer Arrestors.
- X. ASSE 1011 (American Society of Sanitary Engineering) - Hose Connection Vacuum Breakers.
- Y. ASSE 1012 (American Society of Sanitary Engineering) - Backflow Preventers with Immediate Atmospheric Vent.
- Z. ASSE 1013 (American Society of Sanitary Engineering) - Backflow Preventers, Reduced Pressure Principle.
- AA. ASSE 1019 (American Society of Sanitary Engineering) - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.
- BB. AWWA C506 (American Water Works Association) - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.
- CC. PDI WH-201 (Plumbing and Drainage Institute) - Water Hammer Arrestors.
- DD. ASHRAE 90A (American Society of Heating, Refrigerating and Air Conditioning Engineers) - Energy Conservation in New Building.

1.3 SUBMITTALS

- A. Submittals: Provide as per the General Conditions of the Contract.
- B. Product Data:

1. Submit data on pipe materials; pipe fittings, valves, and accessories. Submit manufacturers catalog information. Indicate valve data and ratings.
 - C. Manufacturer's Installation Instructions: Submit installation instructions for valves and accessories.
- 1.4 CLOSEOUT SUBMITTALS
- A. Project Record Documents: Record actual locations of valves and equipment.
 - B. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.
 - B. Provide temporary protective coating on cast iron and steel valves.
 - C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
 - D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- 1.6 FIELD MEASUREMENTS
- A. Verify field measurements prior to fabrication.
- 1.7 WATER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING
- A. Copper Tubing: ASTM B42, hard drawn.
 1. Fittings: ASME B16.18 cast copper alloy or ASME B16.22 wrought copper and bronze.
 2. Joints: AWS A5.8, BCuP silver braze.
 - B. Copper Tubing: ASTM B42, annealed
 1. Fittings: ASME B16.26 cast bronze.
 2. Joints: Flare
- 1.8 WATER PIPING, ABOVE GRADE
- A. Copper Tubing: ASTM B88 (ASTM B88M), Type L, hard drawn.
 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 2. Joints: ASTM B32, solder, Grade 95TA.
 - B. Copper Tubing: ASTM B88 (ASTM B88M), Type L, hard drawn.
 1. Fittings: Cast iron, coated
 2. Joints: Grooved mechanical couplings.
- 1.9 FLANGES, UNIONS, AND COUPLINGS
- A. Pipe Size 3 inches (80 mm) and Under:

1. Ferrous pipe: Class 150 malleable iron threaded unions.
 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Pipe Size Over 1 inch (25 mm):
1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Grooved and Shouldered Pipe End Couplings:
1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
 2. Sealing gasket: "C" shape composition sealing- gasket.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- 1.10 PIPE HANGERS AND SUPPORTS
- A. Provide as per Section 220529.
- 1.11 WATER PRESSURE REDUCING VALVES
- A. Up to 2 inches (50 mm):
1. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, and double union ends.
- B. Over 2 inches (50 mm):
1. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flange
- 1.12 RELIEF VALVES
- A. Pressure Relief:
1. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuate.
- B. Temperature and Pressure Relief:
1. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F (98.9 degrees C), capacity ASME SEC IV certified and labeled.
- 1.13 STRAINERS
- A. Size 2 inch (50 mm) and Under:
1. Threaded brass body for 175 psi (1200 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
- B. Size 1-1/2 inch (40 mm) to 4 inch (100 mm):
1. Class 125, flanged iron body, Y pattern with 1/16-inch (1.6 mm) stainless steel perforated screen.
- C. Size 5 inch (125 mm) and Larger:

1. Class 125, flanged iron body, basket pattern with 1/8 inch (2 mm) stainless steel perforated screen.

1.14 FIRE STOP SYSTEMS

- A. General Purpose Fire Stopping Sealant: Water based, non-slumping, premixed sealant with intumescent properties, rated for 3 hours in accordance with ASTM E814 and UL 1479.
- B. General Purpose Vibration Resistant Fire Stopping Sealant: Silicone based, non-slumping, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours in accordance with ASTM E814 and UL 1479.

1.15 HOSE BIBS

- A. Interior: Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with lock shield and removable key, integral vacuum breaker in conformance with ANSI/ASSE 1011.
- B. Interior Mixing: Bronze or brass, wall mounted, double service faucet with hose thread spout, integral stops, chrome plated where exposed with hand wheels, and vacuum breaker in conformance with ANSI/ASSE 1011.

1.16 HYDRANTS

- A. Wall Hydrant(Sillcock): ANSI/ASSE 1019; non-freeze, self-draining type with polished bronze, wall plate, lockable recessed box, hose thread spout, hand wheel, locks shield and removable key, and integral vacuum breaker.

1.17 BACKFLOW PREVENTERS

- A. Manufacturers: Conbraco, Watts, Febco, Hersey.
- B. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013 AWWA C506
 1. Bronze body, with bronze internal parts and stainless steel springs.
 2. Two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve opening under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

1.18 WATER HAMMER ARRESTORS

- A. Manufacturers: Precision Plumbing Products Company (Wade Shokstop, JR Smith, Josam, Zurn)
- B. ANSI A1126.1; copper, construction, bellows, type sized in accordance with PDI WH-201.
- C. Pre-charged suitable for operation in temperature range 34 to 250 degrees F and maximum 150 psi (1000 kPa) working pressure.

PART 2 EXECUTION

2.1 EXAMINATION

- A. Verify excavations are to required grade, dry, and not over-excavate

2.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.

2.3 INSTALLATION

- A. Install Work in accordance with International Plumbing Code and local / jurisdictional codes.
- B. Install trap primers on all floor drains and floor sinks.
- C. Install non-conducting dielectric connections wherever jointing dissimilar metals.
- D. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- E. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.
- F. Group piping whenever practical at common elevations.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 220529.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with General Contractor.
- I. Establish elevations of buried piping outside the building to obtain not less than 3-1/2 ft of cover.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Install valves with stems upright or horizontal, not inverted.
- L. Install water piping in accordance with ASME B31.9.
- M. Sleeve pipes passing through partitions, walls and floors.
- N. Inserts:
 - 1. Provide inserts for placement in concrete forms.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over **4 inches (100 mm)**.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

- O. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9 ASTM F708 and MSS SP89, and IPC Table.
 - 2. Support horizontal piping as schedule
 - 3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 - 7. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
 - 8. Provide copper plated hangers and supports for copper piping.

- P. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.

- Q. Pipe relief from valves, back-flow preventers and drains to nearest floor drain.

- R. Install water hammer arrestors in accordance to plumbing drainage institute standard WH-201. Provide 8" x 8" access panel to provide access to arrestor.

2.4 SERVICE CONNECTIONS

- A. Provide new water service complete with approved reduced pressure back-flow preventer and pressure reducing valve and sand strainer.

- B. Provide sleeve in wall for service main and support at wall with reinforced-concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

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SECTION 22 1300

SANITARY WASTE AND VENT PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes pipe, pipe fittings, connections and equipment for sanitary sewer piping systems. This section also includes floor drains, cleanouts, interceptors, manholes and sewage ejectors.
- B. Related Sections: Section 220529: Hangers and Supports.
 - 1. Section 220553 - Mechanical Identification: Product requirements for pipe identification for placement by this section.

1.2 REFERENCES

- A. ASME B13 (American Society of Mechanical Engineers) - Malleable Iron Threaded Fittings.
- B. ASME B123 (American Society of Mechanical Engineers) - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- C. ASME B31.9 (American Society of Mechanical Engineers) - Building Services Piping.
- D. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- E. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- F. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- G. ASTM E814 - Fire Tests of Through-Penetration Fire Stops.
- H. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
- I. ASME A1121.1 (American Society of Mechanical Engineers) - Floor Drains.
- J. CISPI 301 (Cast Iron Soil Pipe Institute) - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
- K. CISPI 310 (Cast Iron Soil Pipe Institute) - Joints for Hubless Cast Iron Sanitary Systems.
- L. MSS SP58 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Materials, Design and Manufacturer.
- M. SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
- N. UL 1479 (Underwriters Laboratories, Inc.) - Fire Tests of Through-Penetration Firestops.

1.3 SUBMITTALS

- A. Provide in accordance with the General Conditions of the Contract.

- B. Product Data: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information. Indicate component sizes, rough-in requirements, service sizes, and finishes.
- C. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Do not install underground piping when bedding is wet or frozen.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. Cast Iron Pipe: ASTM A74 – SV weight (service weight),
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.
- B. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- C. PVC Pipe: ASTM D2665, ASTM D3034, or ASTM F679.
 - 1. Fittings: PVC.
 - 2. Joints: ASTM F477, elastomeric gaskets.

2.2 SANITARY SEWER AND VENT PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hub-less, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.3 PIPE HANGERS AND SUPPORTS

- A. Drain, Waste, and Vent: Conform to ASME B31.9, ASTM F708.
- B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Carbon steel, adjustable swivel, split ring.
- C. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.

- D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- E. Wall Support for Pipe Sizes to 3 inches (80 mm): Cast iron hooks.
- F. Wall Support for Pipe Sizes Over 3 inches (100 mm): Welded steel bracket and wrought steel clamp.
- G. Vertical Support: Steel riser clamp.
- H. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- I. Copper Pipe Support: Carbon-steel, copper-plated adjustable ring.

2.4 FIRE STOP SYSTEMS

- A. General Purpose Fire Stopping Sealant: Water based, non-slumping, premixed sealant with intumescent properties, rated for 3 hours in accordance with ASTM E814 and UL 1479.
- B. General Purpose Vibration Resistant Fire Stopping Sealant: Silicone based, non-slumping, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours in accordance with ASTM E814 and UL 1479.

2.5 FLOOR DRAINS

- A. Manufacturers: Wade, JR Smith, Zurn.
- B. Provide as scheduled on the Drawings.
- C. Floor Drain: Lacquered cast iron two piece body with drainage flange, heavy duty grate 6 inches (150 mm) 12 inches (300 mm) wide, 12 inches (300 mm) long, dome strainer, end plates with gaskets.
- D. All floor drains and floor sinks are to have trap primers installed.

2.6 FLOOR SINKS

- A. Manufacturers: Wade, J.R. Smith, Zurn.
- B. Provide as scheduled on the Drawings.
- C. All floor drains and floor sinks are to have trap primers installed.

2.7 CLEANOUTS

- A. Manufacturers: Wade, J.R. Smith, Zurn.
- B. Exterior Surfaced Areas: Round cast nickel bronze access frame and non-skid cover.
- C. Exterior Unsurfaced Areas: Line type with lacquered cast iron body and round epoxy coated cover with gasket.

- D. Interior Finished Floor Areas: Galvanized cast iron body with anchor flange, threaded top assembly, and round scored cover with gasket in service areas and round depressed cover with gasket to accept floor finish in finished floor areas.
- E. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated cover with gasket, and round stainless steel access cover secured with machine screw.
- F. Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

- A. Install Work in accordance with International Plumbing Code and current local / jurisdictional standards.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearances at cleanout for snaking drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- F. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- G. Install piping to maintain headroom. Do not spread piping, conserving space.
- H. Group piping whenever practical at common elevations.
- I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 220700.
- J. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with General Contractor.
- K. Install piping penetrating roofed areas to maintain integrity of roof assembly.

- L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- N. Install bell and spigot pipe with bell end upstream.
- O. Sleeve pipes passing through partitions, walls and floors.
- P. Inserts:
 - 1. Provide inserts for placement in concrete forms.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.
- Q. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9, ASTM F708.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 - 7. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.
 - 8. Provide copper plated hangers and supports for copper piping packing between hanger or support and piping.

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SECTION 22 3300

ELECTRIC, DOMESTIC-WATER HEATERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Commercial, electric, domestic-water booster heaters.
2. Commercial, electric, storage, domestic-water heaters.
3. Commercial, light-duty, storage, electric, domestic-water heaters.
4. Residential, small-capacity, electric, domestic-water heaters.
5. Residential, collector-to-tank, solar, electric, domestic-water heaters.
6. Residential, collector-to-tank-coil, solar, electric, domestic-water heaters.
7. Residential, electric, storage, domestic-water heaters.
8. Residential, tabletop, electric, domestic-water heaters.
9. Flow-control, electric, tankless, domestic-water heaters.
10. Thermostat-control, electric, tankless, domestic-water heaters.
11. Domestic-water heater accessories.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
 1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For commercial domestic-water heaters, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 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.
- B. Product Certificates: For each type of commercial and tankless, electric, domestic-water heater, from manufacturer.
- C. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Warranty: Sample of special warranty.
- 1.6 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For electric, domestic-water heaters to include in emergency, operation, and maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.
- C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."
- 1.8 COORDINATION
- A. Coordinate sizes and locations of concrete bases with actual equipment provided.
- 1.9 WARRANTY
- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.
 - b. Faulty operation of controls.

- c. Deterioration of metals, metal finishes, and other materials beyond normal use.
- 2. Warranty Periods: From date of Substantial Completion.
 - a. Commercial, Electric, Domestic-Water Booster Heaters:
 - 1) Controls and Other Components: Three years.
 - b. Commercial, Electric, Storage, Domestic-Water Heaters:
 - 1) Storage Tank: Three years.
 - 2) Controls and Other Components: Three years.
 - c. Commercial, Light-Duty, Storage, Electric, Domestic-Water Heaters:
 - 1) Storage Tank: Three years.
 - 2) Controls and Other Components: Three years.
 - d. Residential, Electric, Storage, Domestic-Water Heaters:
 - 1) Storage Tank: Five years.
 - 2) Controls and Other Components: Two years.
 - e. Electric, Tankless, Domestic-Water Heaters: Two year(s).
 - f. Compression Tanks: Five years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

- A. Commercial, Electric, Storage, Domestic-Water Heaters:
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [Bradford White Corporation](#);
 - b. [Rheem Manufacturing Company](#);
 - c. [Smith, A. O. Corporation](#);
 - d. Vaughn Water Heaters
 - 2. Standard: UL 1453.
 - 3. Storage-Tank Construction: ASME-code, steel vertical arrangement.
 - a. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.
 - 1) **NPS 2 (DN 50)** and Smaller: Threaded ends according to ASME B1.20.1.
 - 2) **NPS 2-1/2 (DN 65)** and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.
 - b. Pressure Rating: **150 psig (1035 kPa)**.
 - c. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining material into tappings.

4. Factory-Installed Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.
 - b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
 - c. Insulation: Comply with ASHRAE/IESNA 90.1.
 - d. Jacket: Steel with enameled finish.
 - e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.
 - f. Temperature Control: Adjustable thermostat.
 - g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
 - h. Relief Valves: ASME rated and stamped for combination temperature-and-pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.
5. Special Requirements: NSF 5 construction.

B. Commercial, Light-Duty, Storage, Electric, Domestic-Water Heaters:

1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [Bradford White Corporation](#);
 - b. [Rheem Manufacturing Company](#);
 - c. [Smith, A. O. Corporation](#);
 - d. Vaughn Water Heaters
2. Standard: UL 174.
3. Storage-Tank Construction: Steel, vertical arrangement.
 - a. Tappings: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: 150 psig (1035 kPa).
 - c. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining material into tappings.
4. Factory-Installed Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.
 - b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
 - c. Drain Valve: ASSE 1005.
 - d. Insulation: Comply with ASHRAE/IESNA 90.1.
 - e. Jacket: Steel with enameled finish.
 - f. Heat-Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
 - g. Heating Elements: Two; electric, screw-in immersion type; wired for simultaneous operation unless otherwise indicated. Limited to 12 kW total.
 - h. Temperature Control: Adjustable thermostat.
 - i. Safety Control: High-temperature-limit cutoff device or system.
 - j. Relief Valve: ASME rated and stamped for combination temperature-and-pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.
5. Special Requirements: NSF 5 construction with legs for off-floor installation.

C. Capacity and Characteristics: See Plans

1. Electrical Characteristics: See Plans

2.2 ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS

A. Flow-Control, Electric, Tankless, Domestic-Water Heaters:

1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [Bosch Water Heating](#);
 - b. [Eemax, Inc.](#);
 - c. [Stiebel Eltron, Inc.](#);
2. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.
3. Construction: Copper piping or tubing complying with NSF 61 Annex G barrier materials for potable water, without storage capacity.
 - a. Connections: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: **150 psig (1035 kPa)**.
 - c. Heating Element: Resistance heating system.
 - d. Temperature Control: Flow-control fitting.
 - e. Safety Control: High-temperature-limit cutoff device or system.
 - f. Jacket: Aluminum or steel with enameled finish or plastic.
4. Support: Bracket for wall mounting.
5. Capacity and Characteristics: See Plans
 - 1) Maximum Overcurrent Protection: **<Insert amperage>**.

B. Thermostat-Control, Electric, Tankless, Domestic-Water Heaters:

1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [Bosch Water Heating](#);
 - b. [Keltech, Inc.](#);
 - c. [Niagara Industries, Inc.](#);
2. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.
3. Construction: Copper piping or tubing complying with NSF 61 Annex G barrier materials for potable water, without storage capacity.
 - a. Connections: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: **150 psig (1035 kPa)**.
 - c. Heating Element: Resistance heating system.
 - d. Temperature Control: Thermostat.
 - e. Safety Control: High-temperature-limit cutoff device or system.
 - f. Jacket: Aluminum or steel with enameled finish or plastic.
4. Support: Bracket for wall mounting.
5. Capacity and Characteristics: See Plans
 - a. Electrical Characteristics: See Plans

2.3 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. **Products:** Subject to compliance with requirements, provide one of the following:

- a. [AMTROL, Inc.](#);
 - b. [Smith, A. O. Corporation](#);
 - c. [State Industries](#);
 - d. [TACO Comfort Solutions, Inc.](#);
2. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:
- a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
 - b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Air-Charging Valve: Factory installed.
4. Capacity and Characteristics:
- a. Working-Pressure Rating: 150 psig (1035 kPa).
 - b. Capacity Acceptable: 4 gal. (15.1 L) minimum.
 - c. Air Precharge Pressure:
- B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 (DN 20) with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
- C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.
- D. Heat-Trap Fittings: ASHRAE 90.2.
- E. Manifold Kits: Domestic-water heater manufacturer's factory-fabricated inlet and outlet piping for field installation, for multiple domestic-water heater installation. Include ball-, butterfly-, or gate-type shutoff valves to isolate each domestic-water heater and calibrated balancing valves to provide balanced flow through each domestic-water heater.
- 1. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
 - 2. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."
- F. Pressure-Reducing Valves: ASSE 1003 for water. Set at 25-psig- (172.5-kPa-) maximum outlet pressure unless otherwise indicated.
- G. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
- H. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than domestic-water heater working-pressure rating.
- I. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.
- J. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.

- K. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Include dimension that will support bottom of domestic-water heater a minimum of **18 inches (457 mm)** above the floor.
- L. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.4 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
- C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Commercial, Electric, Domestic-Water Heater Mounting: Install commercial, electric, domestic-water heaters on concrete base. Comply with requirements for concrete bases specified in specifications.
 - 1. Exception: Omit concrete bases for commercial, electric, domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
 - 2. Maintain manufacturer's recommended clearances.
 - 3. Arrange units so controls and devices that require servicing are accessible.
 - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on **18-inch (450-mm)** centers around the full perimeter of concrete base.
 - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 8. Anchor domestic-water heaters to substrate.
- B. Residential, Electric, Domestic-Water Heater Mounting: Install residential, electric, domestic-water heaters on floor.
 - 1. Maintain manufacturer's recommended clearances.
 - 2. Arrange units so controls and devices that require servicing are accessible.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 5. Anchor domestic-water heaters to substrate.

- C. Electric, Tankless, Domestic-Water Heater Mounting: Install electric, tankless, domestic-water heaters at least **18 inches (457 mm)** above floor on wall bracket.
1. Maintain manufacturer's recommended clearances.
 2. Arrange units so controls and devices that require servicing are accessible.
 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 5. Anchor domestic-water heaters to substrate.
- D. Install electric, domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
- E. Install commercial, electric, domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- F. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- G. Install combination temperature-and-pressure relief valves in water piping for electric, domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- H. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- I. Install thermometers on outlet piping of electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- J. Install thermometers on inlet and outlet piping of residential, solar, electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- K. Assemble and install inlet and outlet piping manifold kits for multiple electric, domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each electric, domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each electric, domestic-water heater outlet. Comply with requirements for valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- L. Install pressure-reducing valve with integral bypass relief valve in electric, domestic-water booster-heater inlet piping and water hammer arrester in booster-heater outlet piping. Set

pressure-reducing valve for outlet pressure of 25 psig (172 kPa). Comply with requirements for pressure-reducing valves and water hammer arresters specified in Section 221119 "Domestic Water Piping Specialties."

- M. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.
- N. Fill electric, domestic-water heaters with water.
- O. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- C. Prepare test and inspection reports.

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain commercial and tankless, electric, domestic-water heaters.

END OF SECTION 223300

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SECTION 22 4000
PLUMBING FIXTURES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes water closets, urinals, lavatories, faucets, sinks, service sinks, and electric water coolers.
- B. Related Sections:
 - 1. Section 221100 – Domestic Water Piping: Supply connections to plumbing fixtures.
 - 2. Section 221300 – Sanitary Waste and Vent Piping: Waste connections to plumbing fixtures.

1.2 REFERENCES

- A. ARI 1010 (Air-Conditioning and Refrigeration Institute) - Drinking Fountains and self-contained Mechanically Refrigerated Drinking Water Coolers.
- B. ASME A112.6.1 (American Society of Mechanical Engineers) - Supports for Off-the-Floor Plumbing Fixtures for Public Use.
- C. ASME A112.18.1 (American Society of Mechanical Engineers) - Finished and Rough Brass Plumbing Fixture Fittings.
- D. ASME A112.19.1 (American Society of Mechanical Engineers) - Enameled Cast Iron Plumbing Fixtures.
- E. ASME A112.19.2 (American Society of Mechanical Engineers) - Vitreous China Plumbing Fixtures.
- F. ASME A112.19.3 (American Society of Mechanical Engineers) - Stainless Steel Plumbing Fixtures.
- G. ASME A112.19.4 (American Society of Mechanical Engineers) - Porcelain Enameled Formed Steel Plumbing Fixtures.
- H. ASME A112.19.5 (American Society of Mechanical Engineers) - Trim for Water-Closet Bowls, Tanks, and Urinals.

1.3 SUBMITTALS

- A. Submittal: Provide in accordance with the General Conditions of the Contract.
- B. Product Data: Submit catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Installation Instructions: Submit installation methods and procedures.

1.4 CLOSEOUT SUBMITTALS

- A. Provide in accordance with the General Conditions of the Contract.
- B. Operation and Maintenance Data: Submit fixture, trim, exploded view and replacement parts lists.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 PRODUCTS

2.1 FLUSH VALVE WATER CLOSETS

- A. Manufacturers: Kohler, Zurn, Sloan, and American Standard.
- B. Provide as scheduled on the Drawings.

2.2 WALL HUNG URINALS

- A. Manufacturers: Kohler, Zurn, Sloan, and American Standard.
- B. Provide as scheduled on the Drawings.

2.3 WALL HUNG URINALS

- A. Manufacturers: Kohler, Zurn, Sloan, and American Standard..
- B. Provide as scheduled on the Drawings.

2.4 LAVATORIES

- A. Manufacturers: Kohler, Zurn, Sloan, and American Standard.
- B. Provide as scheduled on the Drawings.

2.5 FAUCETS

- A. Manufacturers: Just, Elkay, Zurn, Chicago Faucet, Kohler.

2.6 ELECTRIC WATER COOLERS

- A. Manufacturers: Elkay, Oasis, and Sunroc.
- B. Provide as scheduled on the Drawings.

2.7 SERVICE SINKS

- A. Manufacturers: Kohler, Eljer, and American Standard.

- B. Provide as scheduled on the Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify electric power is available and of correct characteristics.
- C. Confirm millwork is constructed with adequate provision for installation of counter top lavatories and sinks.

3.2 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

- A. Install Work in accordance with International Plumbing Code and local / jurisdictional codes.
- B. Install each fixture with trap, easily removable for servicing and cleaning.
- C. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- D. Install components level and plumb.
- E. Install and secure fixtures in place with wall carriers and bolts.
- F. Seal fixtures to wall and floor surfaces with sealant color to match fixture.

3.4 INTERFACE WITH OTHER PRODUCTS

- A. Review millwork shop-drawings. Confirm location and size of fixtures and openings before rough in and installation.

3.5 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

- A. Clean plumbing fixtures and equipment.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

- A. Do not permit use of fixtures before final acceptance.

END OF SECTION

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DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING

Section 23 0015	General Mechanical Requirements
Section 23 0593	Testing, Adjusting, and Balancing
Section 23 2000	Heating, Cooling, & Steam Piping
Section 23 2116	Piping Specialties
Section 23 2500	Chemical Water Treatment Equipment
Section 23 3100	Ducts
Section 23 3300	Duct Accessories
Section 23 3600	Air Terminal Units
Section 23 3700	Air Outlets and Inlets
Section 23 4000	Air Cleaning Devices

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SECTION 23 0015

GENERAL MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coordination and project conditions.
- B. Products, product options and substitutions.
- C. Closeout procedures.
- D. Submittals.
- E. Test and inspection.
- F. Regulatory requirements.
- G. Cutting and patching.
- H. Special procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
- B. Provide all labor, materials and equipment necessary for completely finished and operational systems as described and specified.
- C. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.
- D. Coordinate space requirements, supports, and installation of mechanical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs. Provide incidental items such as offsets, fittings and accessories required for a completely operational mechanical system.
- E. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of Work in preparation for Substantial Completion.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.3 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Architect/Engineer accepted form.
- B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- C. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite Project, and deliver to Architect/Engineer. Coordinate submission of related items.
- F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.
- G. Identify variations from Contract Documents and product or system limitations, which may be detrimental to successful performance of completed Work.
- H. Allow space on submittals for Contractor and Architect/Engineer review stamps.
- I. When revised for resubmission, identify changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.

1.4 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of Owner-Contractor Agreement Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PRODUCT DATA

- A. Product Data: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents. Provide copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes as described.
- B. Submit number of copies Contractor requires, plus two copies Architect/Engineer will retain.
- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review distribute in accordance with Submittal Procedures article above and provide copies for record documents described.

1.6 SHOP DRAWINGS

- A. Shop Drawings: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents. Produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01700.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.7 TEST REPORTS

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

1.8 CERTIFICATES

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

1.9 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect/Engineer for delivery to Owner in quantities specified for Product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.10 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturer's instructions, including each step in sequence.
- C. When manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
- H. It is the contractor's responsibility to not only ensure equipment is installed properly and has been started properly, but also that the "system" is operating properly. Air handlers can run, boilers can fire, chillers can start, but proper system operation of each individual equipment working together to maintain temperature, pressure, humidity, etc. is crucial.
- I. Mechanical contractor is to notify mechanical engineer of completion of air handling unit. AHU is to be pressurized and pressure tested for tightness, and leakage rate acceptable to engineer's approval.

1.11 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturer's tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.12 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard and all applicable codes, ordinances and regulations in effect, except where specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. When specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- E. Comply with the latest editions of the following:
 - a. International Mechanical Code;
 - b. International Plumbing Code;
 - c. International Building Code;
 - d. International Fuel Gas Code
 - e. International Energy Code
 - f. NFPA 99
 - g. State Department of Health Standards
 - h. Model Energy Code;
 - i. National Fire Protection Standards;

- j. National Electric Code;
- k. Utah State Boiler Code;

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

1.13 PRODUCTS

- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
- C. Furnish interchangeable components from same manufacturer for components being replaced.

1.14 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instruction.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.15 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.
- E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

1.16 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: products of one of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

1.17 PRODUCT SUBSTITUTION PROCEDURES

- A. Architect/Engineer will consider requests for Substitutions only within 15 days after date established in Notice to Proceed.
- B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that Contractor:
 - 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 - 2. Will provide same warranty for Substitution as for specified product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.
- E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
- F. Substitution Submittal Procedure:
 - 1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
 - 2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
 - 3. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

1.18 CLOSEOUT PROCEDURES

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

1.19 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.

- B. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.
- C. Replace filters of operating equipment.
- D. Clean debris from roofs, gutters, downspouts, and drainage systems.
- E. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.20 STARTING OF SYTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect/Engineer seven days prior to start-up of each item.
- C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable manufacturer's representative and Contractors' personnel in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

1.21 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
- B. Demonstrate Project equipment and instruct by manufacturer's representative who is knowledgeable about the Project.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time agreed time, at designated location.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

1.22 TESTING, ADJUSTING AND BALANCING

- A. Independent firm will perform services specified in Section 230593.
- B. Reports will be submitted by independent firm to Architect/Engineer indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents.

1.23 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

1.24 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, Product Data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to finish first floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Contract drawings.
- G. Submit documents to Architect/Engineer.

1.25 OPERATION AND MAINTENANCE DATA

- A. Submit data bound in 8-1/2 x 11 inch (A4) text pages, three D side ring binders with durable plastic cloth covers.

- B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.
- C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- E. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for [special] finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 - 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data.
 - b. Air and water balance reports.
 - c. Certificates.
 - d. Photocopies of warranties and bonds.

1.26 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned [after final inspection], with Architect/Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit three sets of revised final volumes in final form within 10 days after final inspection.
- E. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

- F. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and special operating instructions.
- G. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- H. Include servicing and lubrication schedule, and list of lubricants required.
- I. Include manufacturer's printed operation and maintenance instructions.
- J. Include sequence of operation by controls manufacturer.
- K. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- L. Include control diagrams by controls manufacturer as installed.
- M. Include Contractor's coordination drawings, with color coded piping diagrams as installed.
- N. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- O. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- P. Include test and balancing reports as specified in Section 230593.
- Q. Additional Requirements: As specified in individual product specification sections.
- R. Include listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

1.27 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.
- B. Deliver to Project site. Obtain receipt.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes testing, adjusting, and balancing of air systems, testing, adjusting, and balancing of hydronic systems, measurement of final operating condition of HVAC systems, sound measurement of equipment operating conditions, vibration measurement of equipment operating conditions.

1.2 REFERENCES

- A. AABC (Associated Air Balance Council) - National Standards for Total System Balance.
- B. ASHRAE 111 (American Society of Heating, Refrigerating and Air-Conditioning Engineers) - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
- C. NEBB (National Environmental Balancing Bureau) - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

1.3 SUBMITTALS

- A. Provide in accordance with the General Conditions of the Contract.
- B. Test Reports: Indicate data on AABC National Standards for Total System Balance forms or NEBB Report forms.
- C. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- D. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
- E. Submit draft copies of report for review prior to final acceptance of Project. Furnish final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.
- F. Furnish reports in a 3-ring binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
- G. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty and Copy of NEBB Certificate of Conformance Certification prior to commencing system balance.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of flow measuring stations balancing valves and rough setting.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems
- B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Agency: Company specializing in testing, adjusting, and balancing of systems specified in this section with minimum 10 years documented experience certified by AABC or Certified by NEBB.
- B. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor.
- C. Acceptable other contractors.
 - 1. BTC services, Certified Testing & Balancing
 - 2. Other may be accepted upon approval of Mechanical Engineer . Submit qualifications to Josh Elliott at PVE, Inc. (jelliott@pve-ut.com)

1.7 SEQUENCING

- A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.8 SCHEDULING

- A. Schedule and provide assistance in final adjustment and test of life safety system with Fire Authority.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify systems are complete and operable before commencing work. Verify the following:
 - 1. Systems are started and operating in safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.

12. Hydronic systems are flushed, filled, and vented. T & B contractor must have the flush & cleaning reports on hand when performing test & balancing.
 13. Pumps are rotating correctly.
 14. All springs (inertia bases, in-line pumps, supply fans, exhaust fans, etc.) have the factory shipping support blocks removed and functioning properly.
 15. Proper strainer baskets are clean and in place or in normal position.
 16. Service and balancing valves are open.
- B. Submit field reports. Report defects and deficiencies noted during performance of services, preventing system balance.

3.2 PREPARATION

- A. Furnish instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.3 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

- A. Verify recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner.
- F. Check and adjust systems approximately six months after final acceptance and submit report.

3.5 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to obtain required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in main ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts.

- E. Use volume control devices to regulate air quantities only to extent adjustments do not create objectionable air motion or sound levels. Effect volume control by using volume dampers located in ducts.
- F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. At modulating damper locations, take measurements and balance at extreme conditions. Balance variable volume systems at maximum airflow rate, full cooling, and at minimum airflow rate, full heating.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to obtain required relationship between each to maintain approximately 0.05 inches positive static pressure near building entries.
- M. On fan powered VAV boxes, adjust airflow switches for proper operation.

3.6 WATER SYSTEM PROCEDURE

- A. Adjust water systems, after air balancing, to obtain design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow-metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in system.
- C. Adjust systems to obtain specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open or in normal position to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Where available pump capacity is less than total flow requirements or individual system parts, simulate full flow in one part by temporary restriction of flow to other parts.

3.7 SCHEDULES

END OF SECTION

SECTION 23 2000

HEATING, COOLING, AND STEAM PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes systems, accessories, valves, pipe and pipe fittings for: heating water, chilled water, steam, and glycol.
- B. Related Sections:
 - 1. Section 22 05 45 - Mechanical Sound, Vibration, and Seismic Control: Product requirements for Vibration Isolation for placement by this section.
 - 2. Section 22 07 00 - Mechanical Insulation: Product requirements for Piping Insulation for placement by this section.
 - 3. Div. 16 - Wiring Connections: Execution requirements for electric connections specified by this section.
 - 4. Section 22 05 29 – Hangers and Supports.

1.2 REFERENCES

- A. ASME (American Society of Mechanical Engineers) - Boiler and Pressure Vessel Codes, SEC IX - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.
- B. ASME B16.22 (American Society of Mechanical Engineers) - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- C. ASME B16.26 (American Society of Mechanical Engineers) - Cast Copper Alloy Fittings For Flared Copper Tubes.
- D. ASME SEC VIII-D (American Society of Mechanical Engineers) - Boilers and Pressure Vessels Code, Rules for Construction of Pressure Vessels.
- E. ASME B16.3 (American Society of Mechanical Engineers) - Malleable Iron Threaded Fittings Class 50 and 300.
- F. ASME B16.18 (American Society of Mechanical Engineers) - Cast Copper Alloy Solder Joint Pressure Fittings.
- G. ASME B16.22 (American Society of Mechanical Engineers) - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- H. ASME B31.1 (American Society of Mechanical Engineers) - Power Piping.
- I. ASME B31.9 (American Society of Mechanical Engineers) - Building Services Piping.
- J. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- K. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- L. ASTM A536 – Ductile Iron Castings.
- M. ASTM B32 - Solder Metal.

- N. ASTM B88 - Seamless Copper Water Tube.
- O. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration
- P. ASTM F1476 – Grooved Mechanical Couplings.
- Q. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
- R. AWS A5.8 (American Welding Society) - Brazing Filler Metal.
- S. AWS D1.1 (American Welding Society) - Structural Welding Code.
- T. AWWA C606 (American Water Works Association) – Grooved and Shouldered Joints.
- U. MSS SP69 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Selection and Application.
- V. MSS SP89 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Fabrication and Installation Practices.
- W. UL 429 (Underwriters Laboratories, Inc.) - Electrically Operated Valves.

1.3 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, provide compatible system components and joints. Provide flanges, union, and couplings at locations requiring servicing.
- B. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Use non-conducting dielectric connections whenever joining dissimilar metals in open systems. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- C. Provide pipe hangers and supports in accordance with ASME B31.1, ASME B31.9, MSS SP69.
- D. Use ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Use globe ball or butterfly valves for throttling, bypass, or manual flow control services.
- F. Use spring loaded check valves on discharge of heating water pumps.
- G. Use plug cocks for throttling service. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.
- H. Use lug or grooved end butterfly valves to isolate equipment.
- I. Use **3/4 inch (20 mm)** ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

1.4 SUBMITTALS

- A. Submittal Procedures as per the General Conditions of the Contract.
- B. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.

- C. Welders' Certificate: Include welders' certification of compliance with ASME/SEC 9. AWS D1.1.
- D. Grooved joint couplings and fittings shall be shown on drawings and product submittals and shall be specifically identified with the applicable Victaulic style or series number.

1.5 CLOSEOUT SUBMITTALS

- A. Execution Requirements: Closeout procedures as per the General Conditions of the Contract.
- B. Project Record Documents: Record actual locations of valves and equipment.
- C. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ASME B31.1, B31.9 code for installation of piping systems and ASME SEC IX for welding materials and procedures.
- B. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.
- C. To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system Protect
- D. Dehydrate and charge refrigeration components including piping and receivers, seal prior to shipment. Maintain seal until connected into system.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 HEATING, COOLING WATER AND GLYCOL PIPING, ABOVE GROUND

- A. Steel Pipe: ASTM A53, Schedule 40, 0.375 inch (10 mm) wall for sizes 12 inch (300 mm) and over, black.
 - 1. Fittings:
 - a. ASTM B16.3, malleable iron or ASTM A234, forged steel welding type fittings.
 - b. ASTM A536, ductile iron, ASTM A234, forged steel, or ASTM A53 fabricated from carbon steel pipe with factory grooved ends designed to accept Victaulic couplings.
 - 2. Joints:

- a. Threaded, or welded.
 - b. Victaulic grooved mechanical couplings.
- B. Copper Tubing: ASTM B88, Type M and DWV, [L] hard drawn.
 - 1. Fittings:
 - a. ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
 - b. ASME B16.22, wrought copper, or ASME B16.18 bronze castings with copper tubing sized grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted).
 - 2. Joints:
 - a. Victaulic grooved mechanical couplings.

2.2 UNIONS, FLANGES, AND COUPLINGS

- A. Unions for Pipe **2 inches (50 mm)** and Under:
 - 1. Ferrous Piping: **150 psig (1034 kPa)** malleable iron, threaded.
 - 2. Copper Pipe: Bronze, soldered joints.
- B. Flanges for Pipe Over **2 inches (50 mm)**:
 - 1. Ferrous Piping: **150 psig (1034 kPa)** forged steel, slip-on.
 - 2. Copper Piping: Bronze.
 - 3. Gaskets: **1/16 inch (1.6 mm)** thick preformed neoprene.
- C. Grooved and Shouldered Steel Pipe End Couplings:
 - 1. Housing Clamps: ductile iron to engage and lock designed to permit some angular deflection, contraction, and expansion.
 - 2. Sealing Gasket:
 - a. C-shape or FlushSeal® elastomer composition for operating temperature range from **-30 degrees F to 230 degrees F**.
 - b. QuickVic™ elastomer composition for operating temperature range from **-30 degrees F to 250 degrees F**.
 - 3. Accessories: Steel bolts, nuts, and washers.
 - 4. Rigid Type: Housings shall be cast with offsetting, angle-pattern bolt pads to provide system rigidity and support and hanging in accordance with ASME B31.1 and B31.9.
 - a. 2" through 8": "Installation Ready" stab-on design, for direct 'stab' installation onto grooved end steel pipe without prior field disassembly and no loose parts with Grade "EHP" EPDM QuickVic™ gasket. Victaulic Style 107H QuickVic™.
 - b. 10" and 12": Standard rigid coupling design with Grade "E" EPDM C-shaped gasket. Victaulic Style 07 Zero-Flex®.
 - c. 14" through 60": AGS two-piece housing design cast with a wide key profile and flat bolt pads to fit into a deeper, wedge-shaped groove, Grade "E" EPDM FlushSeal® gasket. Victaulic Style W07.
 - 5. Flexible Type: Use in seismic areas and locations where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. Three couplings, for each connector, shall be placed in close proximity to the source of vibration.
 - a. 2" through 8": "Installation Ready" stab-on design, for direct 'stab' installation onto grooved end steel pipe without prior field disassembly and no loose parts with Grade "EHP" EPDM QuickVic™ gasket. Victaulic Style 177 QuickVic™.
 - b. 10" and 12": Standard flexible coupling design with Grade "E" EPDM C-shaped gasket. Victaulic Style 77.
 - c. 14" through 60": AGS two-piece housing design cast with a wide key profile and flat bolt pads to fit into a deeper, wedge-shaped groove, Grade "E" EPDM FlushSeal® gasket. Victaulic Style W77.

- D. Grooved End Copper Tube Couplings:
 - 1. Housings Clamps: Ductile iron, cast with offsetting, angle-pattern bolt pads, coated with copper-colored enamel, to engage and lock, designed to permit some angular deflection, contraction and expansion.
 - 2. Sealing Gaskets: QuickVic™ Grade “EHP” EPDM elastomer composition for operating temperature range from **-30 degrees F to 250 degrees F**
 - 3. Accessories: Plated steel bolts and nuts.
 - 4. Design: “Installation Ready” stab-on design, for direct ‘stab’ installation onto roll grooved copper tube without prior field disassembly and no loose parts. Victaulic Style 607H QuickVic™.
- E. Dielectric Connections:
 - 1. Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.
 - 2. Waterway fitting with zinc-plated steel or ductile iron body with male threaded or grooved ends and LTHS high temperature polyolefin polymer lining. Victaulic Style 47.

2.3 PIPE HANGERS AND SUPPORTS

- A. Provide as per Section 15060.
- B. Victaulic Style 107H, 07, and W07 rigid couplings may be used with IPS steel piping systems, which meet the support and hanging requirements of ASME B31.1 and B31.9. An adequate number of Victaulic Style 177, 77 and W77 flexible couplings shall also be used to compensate for thermal expansion/contraction of the pipe.

PART 3 EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges, Victaulic couplings, or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems. Refer to Section 23 25 00.

3.2 INSTALLATION

- A. Install glycol piping in accordance with ASME B31.9.
- B. Route piping parallel to building structure and maintain gradient.
- C. Install piping to conserve building space, and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Sleeve pipe passing through partitions, walls and floors.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 05 48.

- G. Inserts:
1. Provide inserts for placement in concrete forms.
 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over **4 inches (100 mm)**.
 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut, flush with top of slab.
- H. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9, ASTM F708 and MSS SP89.
 2. Support horizontal piping as scheduled.
 3. Install hangers to provide minimum **1/2 inch (13 mm)** space between finished covering and adjacent work.
 4. Place hangers within **12 inches (300 mm)** of each horizontal elbow.
 5. Use hangers with **1-1/2 inch (38 mm)** minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 7. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.
 8. Provide copper plated hangers and supports for copper piping.
- I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- J. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with General Contractor.
- K. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
1. Slope steam piping one inch in **40 feet (0.25 percent)** in direction of flow. Use eccentric reducers to maintain bottom of pipe level.
- L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- M. Install valves with stems upright or horizontal, not inverted.
- N. Insulate piping and equipment; refer to Section 220700.
- O. Grooved joint piping systems shall be installed in accordance with the manufacturer's (Victaulic) guidelines and recommendations. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by Victaulic. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A Victaulic factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

END OF SECTION

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SECTION 23 2116
PIPING SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes pressure gages and pressure gage taps, thermometers and thermometer wells, static pressure gages, filter gages. Section also includes, expansion tanks, air vents, air separators, strainers, pump suction fittings, combination fittings, flow indicators, controls, meters. Section also includes glycol specialties, pressure-reducing valves.
- B. Related Sections:
 - 1. Section 23 20 00 – Heating, Cooling, and Steam Piping: Execution requirements for piping connections to products specified by this section.

1.2 REFERENCES

- A. ASME (American Society of Mechanical Engineers) - Boiler and Pressure Vessel Codes, SEC VIII-D - Rules for Construction of Pressure Vessels.
- B. ASME B40.1 (American Society of Mechanical Engineers) - Gauges - Pressure Indicating Dial Type - Elastic Element.
- C. ASTM E1 - Standard Specification for ASTM Thermometers.
- D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.
- E. ASTM A105 - Forgings, Carbon Steel, for Piping Components.
- F. ASTM A126 - Grey Iron Castings for Valves, Flanges, and Pipe Fittings.
- G. ASTM A216 - Steel Casings, Carbon, Suitable for Fusion Welding, for High Temperature Service.
- H. ASTM A395 - Ferric Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

1.3 SUBMITTALS

- A. Product Data: Submit for manufactured products and assemblies used in this Project as per the General Conditions of this Contract.
 - 1. Manufacturer's data indicating use, operating range, total range, accuracy, and location for manufactured components.
 - 2. Submit product description, model, dimensions, component sizes, service sizes, and finishes.
 - 3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each specialty.
 - 4. Submit electrical characteristics and connection requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Execution Requirements: Closeout procedures.

- B. Project Record Documents: Record actual locations of actual locations of components and instrumentation, flow controls flow meters.
- C. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction, and replacement parts list as per the General Conditions of the Contract.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Protect systems from entry of foreign materials by temporary covers, caps and closures, completing sections of the work, and isolating parts of completed system until installation.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not install instruments when areas are under construction, except rough in, taps, supports and test plugs.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements before fabrication.

1.8 MAINTENANCE SERVICE

- A. Execution Requirements: Maintenance service.
- B. Furnish bi-annual visit for one year starting from Date of Substantial Completion to make glycol fluid concentration analysis on site with refractive index measurement instrument. Detail findings with maintenance personnel in writing of corrective actions needed including analysis and amounts of glycol or water added.

1.9 EXTRA MATERIALS

- A. Provide sufficient inhibited propylene glycol to maintain specified concentrations for the one-year warranty period.

PART 2 PRODUCTS

2.1 PRESSURE GAGES

- A. Gage: ASME B40.1, with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
 1. Case: Cast Aluminum.
 2. Bourdon Tube: Brass.
 3. Dial Size: 4-1/2 inch (114 mm).
 4. Mid-Scale Accuracy: One.
 5. Scale: Both psi and kPa.
 6. Verify maximum pressure to be read prior to installation.

2.2 PRESSURE GAGE TAPS

- A. Needle Valve:
 1. Brass, 1/4 inch (6 mm) NPT for minimum 300 psi (2070 kPa).

- B. Ball Valve:
 - 1. Brass, 1/4 inch (6 mm) NPT for 250 psi (1720 kPa).
- C. Pulsation Damper:
 - 1. Pressure snubber, brass with 1/4 inch (6 mm) NPT connections.

2.3 STEM TYPE THERMOMETERS

- A. Manufacturers: Weiss Instruments
- B. Thermometer: Vari-Angle Digital industrial glass thermometer that is self-powered.
 - 1. Case: Hi-impact ABS
 - 2. Range: -40 / 300°F
 - 3. Display: 3/8" LCD digits, wide ambient formula
 - 4. Accuracy: 1 percent of reading or 1°F whichever is greater
 - 5. Re-Calibration: Internal potentiometer
 - 6. Update: Every 10 seconds
 - 7. Resolution: 1/10° between -19.9 / 199.9°F
 - 8. Lux Rating: 10 Lux (one foot-candle)
 - 9. Sensor: Glass passivated thermistor
 - 10. Ambient Temp Error: Zero
 - 11. Stem Assemblies: Industrial Glass - Full conformance with Fed. Spec. GG-T-321D. Fully interchangeable with Industrial Glass Thermometers
 - 12. Model: DVS35

2.4 TEST PLUGS

- A. Manufacturers: Teriece, Fairfax, Peterson Equipment.
- B. 1/4 inch (6 mm) NPT or 1/2 inch (13 mm) NPT brass fitting and cap for receiving 1/8 inch (3 mm) outside diameter pressure or temperature probe with:
 - 1. Neoprene core for temperatures up to 200 degrees F (93 degrees C).
 - 2. Nordel core for temperatures up to 350 degrees F (176 degrees C).
 - 3. Viton core for temperatures up to 400 degrees F (204 degrees C).
 - 4. Extension for insulated pipe.
- C. Test Kit:
 - 1. Carrying case, internally padded and fitted containing:
 - a. One 2-1/2 inch (64 mm) diameter pressure gages.
 - 1) Scale range: 0 to 100 psi
 - b. One gage adapters with 1/8 inch (3 mm) probes.
 - c. Two 1-1/2 inch (38 mm) dial thermometers.
 - 1) Scale range: 30 to 240 degrees F.

2.5 DIAPHRAGM-TYPE EXPANSION TANKS

- A. Construction: Welded steel, tested and stamped in accordance with ASME SEC 8-D; supplied with National Board Form U-1, rated for working pressure of 200 psig (860 kPa), with flexible EPDM diaphragm sealed into tank, and steel support stand. Pressure rating of the expansion tank for the domestic water booster pump is to rated for a working pressure of 275 psig.
- B. Accessories: Pressure gage and air-charging fitting, tank drain; pre-charge to 20 psig
- C. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure back flow prevention device, test cocks, strainer, vacuum breaker, and by-pass valves.

- D. Contractor is to provided & install a domestic hot water expansion tank on hot water heaters. Verify (if necessary) final size with mechanical engineer.
- E. Size: As Scheduled on the Drawings.

2.6 AIR VENTS

- A. Manual Type: Short vertical sections of **2 inch (50 mm)** diameter pipe to form air chamber, with **1/8 inch (3 mm)** brass needle valve at top of chamber.
- B. Float Type:
 - 1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

2.7 AIR SEPARATORS

- A. Manufacturers: Bell and Crossett, Amtrol, Armstrong, Taco.
- B. Dip Tube Fitting:
 - 1. For **150 psig (860 kPa)** operating pressure; to prevent free air collected in boiler from rising into system.
- C. In-line Air Separators:
 - 1. Cast iron for sizes **1-1/2 inch (40 mm)** and smaller, or steel for sizes **2 inch (50 mm)** and larger; tested and stamped in accordance with ASME SEC 8-D; for **150 psig (860 kPa)** operating pressure.
- D. Combination Air Separators/Strainers:
 - 1. Steel, tested and stamped in accordance with ASME SEC 8-D; for **150 psig (860 kPa)** operating pressure, with integral galvanized steel strainer, tangential inlet and outlet connections, and internal stainless steel air collector tube.
- E. Size: As scheduled in drawing.

2.8 STRAINERS

- A. Manufacturers: Armstrong, Itt, Keckley, Mueller, Metraflex, Victaulic, Gustin, and Bacon.
- B. Size **2 inch (50 mm)** and Under:
 - 1. Screwed brass or iron body for **275 psig (1200 kPa)** working pressure, Y pattern with **1/32 inch (0.8 mm)** stainless steel perforated screen.
- C. Size **2-1/2 inch (65 mm)** to **4 inch (100 mm)**:
 - 1. Flanged iron body for **275 psig (1200 kPa)** working pressure, Y pattern with **3/64 inch (1.2 mm)** stainless steel perforated screen.
- D. Size **5 inch (125 mm)** and Larger:
 - 1. Flanged iron body for **275 psig (1200 kPa)** working pressure, basket pattern with **1/8 inch (3.2 mm)** stainless steel perforated screen.

2.9 FLOW METERS

- A. Manufacturers: Bell and Crossett, Lierand, Armstrong, Taco, Amtrol.

- B. Orifice type by-pass circuit with direct reading gage, soldered or flanged piping connections for 250 psig (860 kPa) working pressure, with shut off valves, and drain and vent connections.
- C. Direct reading with insert pitot tube, threaded coupling, for 250 psig (1034 kPa) working pressure, maximum 240 degrees F (115 degrees C), 5 percent accuracy.
- D. Cast iron, wafer type, orifice insert flow meter for 250 psig (1720 kPa) working pressure, with read-out valves equipped with integral check-valves and caps with gaskets.
- E. Calibrated, plug type balancing valve with precision-machined orifice, readout valves equipped with integral check valves and caps with gaskets, calibrated nameplate and indicating pointer.
- F. Cast iron or bronze, globe style, balancing valve with hand wheel with vernier type ring setting and memory stop, drain connection, readout valves equipped with integral check valves and caps with gaskets.

2.10 RELIEF VALVES

- A. Manufacturers: Kunkle, Watts, McDonnell & Miller.
- B. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

2.11 GLYCOL CHARGING

- A. Mixing Tank: 55 gallon poly tank & removable lid with pumps, isolation valves, check valves, pre-manuf. Wiring, fittings, etc. suitable for filling.
- B. Storage Tank: Closed type, welded steel constructed, tested and stamped in accordance with ASME SEC 8-D; 150 psi rating; cleaned, prime coated, and supplied with steel support saddles. Construct with taps for installation of accessories.

2.12 GLYCOL SOLUTION

- A. Inhibited propylene glycol and water solution mixed 35 percent glycol - 65 percent water. (As scheduled in drawing) See pump schedule for other requirements.

PART 3 EXECUTION

3.1 INSTALLATION

- B. Install one pressure gage for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gage.
- C. Install gage taps in piping
- D. Install pressure gages with pulsation dampers.
- E. Provide needle valve or ball valve to isolate each gage. Extend nipples to allow clearance from insulation.
- F. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches (64 mm) for installation of thermometer sockets. Allow clearance from insulation. Thermometers are to be installed on chilled water system at or near the chiller, on boiler system at or near both the boiler and secondary heating

system, on domestic water system at or near the water heater, on the cold water entry, and on steam systems.

- G. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets.
- H. Install static pressure gages to measure across filters and filter banks, (inlet to outlet). On multiple banks, provide manifold and single gage.
- I. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- J. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- K. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.
- L. Locate test plugs.
- M. Install auto air vents at system high points.
- N. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
- O. Provide air separator on suction side of system circulation pump and connect to expansion tank.
- P. Provide drain and hose connection with valve on strainer blow down connection.
- Q. Provide relief valves on pressure tanks, low-pressure side of reducing valves, heat exchangers, and expansion tanks.
- R. Select system relief valve capacity greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.
- S. Pipe relief valve outlet to nearest floor drain.
- T. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.
- U. Feed glycol solution to system through make-up line with pressure regulator, venting system high points. Set to fill at final field verified psi.

2.1 FIELD QUALITY CONTROL

- A. Test for strength of glycol and water solution and submit written test results.

2.2 CLEANING

- A. Clean and flush glycol system before adding glycol solution.

2.3 PROTECTION OF INSTALLED CONSTRUCTION

- A. Do not install hydronic and steam pressure gauges until after systems are pressure treated.

END OF SECTION

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SECTION 23 2500

CHEMICAL WATER TREATMENT EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes installation, pre start up, flushing and cleaning of piping systems, , and chemical treatment with associated piping fittings, feeders, pumps, tanks, controls, control wiring, motors, starters, meters and valves.
- B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to work of this section.
- C. General: The chemical water treatment system to be provided under these plans and specifications shall be a complete system and shall be supplied by ClearWater Industries, Power Engineering Co., or Alpine Technical Services. The chemical supplier shall supply field supervision for the pre-start-up, flushing and cleaning of all piping.
- D. Submittals: Provide in accordance with the General Conditions of the Contract.
- E. Shop Drawings: Indicate system schematic, equipment locations, electrical characteristics and connection requirements.
- F. Product Data: Submit chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.
- G. Manufacturer's Installation Instructions: Submit placement of equipment in systems, piping configuration, and connection requirements.
- H. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- I. Manufacturers Field Reports: Indicate start-up of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.
- J. Technical Data: submit shop drawings and product data for the following items in accordance with the General Conditions of the contract: Water Treatment Materials and Equipment, Control Diagrams, and Chemical & Quality provided.
- K. Operating Instructions and Maintenance Data: Submit printed Operating Instructions and Maintenance Data for the following items:
 - 1. All Water treatment Materials and Equipment
 - 2. Control Diagrams
 - 3. Water Treatment Program Control Chart.

1.2 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of equipment and piping, including sampling points and location of chemical injectors.
- B. Operation and Maintenance Data: Submit data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step-by-step instructions on test procedures including target concentrations.

- C. If the contractor's warranty period extends beyond one year from chemical feed equipment start-up, the contractor shall negotiate an additional service retainer to cover the remainder of the warranty period.

PART 2 PRODUCTS

2.1 SYSTEM CLEANER

- A. Product Description: Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products.

2.2 CLOSED SYSTEM TREATMENT (CHILLED AND HEATING WATER SYSTEM)

- A. Sequestering agent to reduce deposits and adjust pH; polyphosphate.
- B. Provide & Install equipment & materials for cleaner, treatment, and dual glycol feeder.
- C. Corrosion inhibitors; liquid boron-nitrite. Plus an azole inhibitor treatment for the prevention of corrosion in closed system at 700 ppm total nitrite level.

2.3 BY-PASS (POT) FEEDER

2.4 GLYCOL WATER SYSTEMS

- A. Chemicals:
 - 1. Liquid Cleaner
 - 2. Huntsman Inhibited Propylene Glycol, 250° F maximum temperature.
 - 3. Liquid Alkaline dispersant cleaner to remove oil and foreign matter from the system prior to start-up.
- B. Equipment:
 - 1. 55 gallon polyethylene mixing tank with tank mounted, 1/3 HP 120/1/60, electric motor driven gear pump, low level switch to activate audible alarm and lock-out glycol feed pump, integral Nema 4X control panel with H-O-A switch, adjustable pressure switch and connecting tubing and y-strainer in pump suction as shown in contract drawings.

PART 3 EXECUTION

3.1 PREPARATION

- A. Operate, fill, start and vent systems prior to cleaning. Use water meter to record capacity in each system. Place terminal control valves in open position during cleaning.

3.2 CLEANING

- A. Concentration:
 - 1. Cleaning shall be performed by the Contractor under the supervision of the chemical supplier at the time of start-up. The system shall be filled with water and checked for leakage and debris. Add the proper dosage of liquid alkaline cleaner and circulate for 48 hours at the required temperature. Drain and flush piping – clean the strainers. Flush the system until the pH is no more than eight (8.0).

- B. Hot Water Heating Systems:
1. Apply heat while circulating, slowly raising temperature to 160 degrees F (71 degrees C) and maintain for 12 hours minimum.
 2. Remove heat and circulate to 100 degrees F (37.8 degrees C) or less; drain systems as quickly as possible and refill with clean water.
 3. Circulate for 6 hours at design temperatures, then drain.
 4. Refill with clean water and repeat until system cleaner is removed.
 5. The system shall be filled with water and checked for leakage and debris. Add the proper dosage of Liquid Alkaline Cleaner and circulate for 48 hours at the required temperature. Drain and flush piping. Clean the strainers. Flush until system pH is no more than eight.
 6. Clean all strainers at conclusion of system cleaning.
- C. Glycol Water Systems:
1. Cleaning shall be performed by the Contractor at the time of start-up. The system shall be filled with water and checked for leakage and debris. Add the proper dosage of Liquid Cleaner and circulate for 48 hours at the required temperature. Drain and flush piping. Clean the strainers. Flush until system pH is no more than eight.
 2. Clean all strainers at conclusion of system cleaning.
- D. Control: Charge system with glycol/soft water mixture as designated in the contract drawings.
- E. Use neutralizer agents on recommendation of system cleaner supplier and acceptance of Architect/Engineer.
- F. Flush open systems and glycol filled closed systems with clean water for one hour minimum. Drain completely and refill.
- G. Remove pre-construction strainer, clean, and replace with operating strainer screens.
- H. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.
- I. Circulate for 24 hours with cleaner. Start a bleed with city water to make a closed system. Maintaining working psi. (Typical of both heating and chilled system.)

3.3 CLOSED SYSTEM TREATMENT

- A. Provide one bypass feeder on each system. Install isolating and drain valves and interconnecting piping. Install around balancing valve downstream of circulating pumps.
- B. Introduce closed system treatment through bypass feeder when required or indicated by test.

END OF SECTION

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SECTION 23 3100 DUCTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes metal ductwork, nonmetallic ductwork, casing and plenums, buried ductwork, kitchen hood ductwork, duct cleaning.
- B. Related Sections:
 - 1. Section 220529 – Hangers and Supports: Product requirements for hangers, supports and sleeves for placement by this section.

1.2 REFERENCES

- A. ASTM A36 - Structural Steel.
- B. ASTM A90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
- C. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- D. ASTM A366 - Steel, Sheet, Carbon, Cold Rolled, Commercial Quality.
- E. ASTM A568 - Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.
- F. ASTM A569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality.
- G. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- H. NFPA 90A (National Fire Protection Association) - Installation of Air Conditioning and Ventilating Systems.
- I. NFPA 90B (National Fire Protection Association) - Installation of Warm Air Heating and Air Conditioning Systems.
- J. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) - HVAC Air Duct Leakage Test Manual.
- K. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards - Metal and Flexible.
- L. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) - Fibrous Glass Duct Construction Standards.
- M. UL 181 (Underwriters Laboratories, Inc.) - Factory-Made Air Ducts and Connectors.

1.3 PERFORMANCE REQUIREMENTS

- A. No variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is permitted except by written permission. Size No round ducts installed in

place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.4 SUBMITTALS

- A. Provide in accordance with the General Conditions of the Contract.
- B. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual.
- C. Manufacturer's Installation Instructions: Submit special procedures for glass fiber ducts.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.
- B. Construct ductwork to NFPA 90A and NFPA 90B standards.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures during and after installation of duct sealant.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.9 WARRANTY

- A. Furnish 1 year manufacturers warranty for ducts.

PART 2 PRODUCTS

2.1 DUCT MATERIALS

- A. Galvanized Steel Ducts: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having G60 zinc coating of in conformance with ASTM A90.
- B. Steel Ducts: ASTM A366 A569 A568.
- C. Aluminum Ducts: ASTM B209; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061- T6 or of equivalent strength.
- D. Fasteners: Rivets, bolts, or sheet metal screws.

- E. Hanger Rod: ASTM A36; steel, galvanized threaded both ends, threaded one end, or continuously threaded.

2.2 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings. Furnish duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch (100 mm) cemented slip joint, brazed or electric welded. Prime coat welded joints.
- E. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.
- F. Radius elbows shall be used in lieu of 90's with turning vanes. If there is any conflict on the plans, coordinate with engineer prior to construction.
- G. All high pressure take-off's from the shaft shall have high efficiency take-off's. All low pressure take-off's shall have HET's.

2.3 Insulated Flexible Ducts:

- A. Manufacturers: Flex Master
- B. When using flexible duct, contractor is to install rigid duct with a 90° elbow facing down, then install flex duct vertically from the 90° elbow to the grille or register. There are cases where this is not possible and we understand this.
- C. Two ply vinyl film supported by helical wound spring steel wire; fiberglass insulation; polyethylene aluminized vapor barrier film.
 1. Pressure Rating: 10 inches wg (2.50 kPa) positive and 1.0 inches wg (250 Pa) negative.
 2. Maximum Velocity: 4000 fpm (20.3 m/sec).
 3. Temperature Range: -10 degrees F to 160 degrees F (-23 degrees C to 71 degrees C).

2.4 GLASS FIBER DUCTS

- A. Fabricate in accordance with SMACNA Fibrous Glass Duct Construction Standards, except as indicated on Drawings. (Return air boots and transfer ducts only).
- B. Pressure sensitive tape, UL approved. 2 inch (50mm) wide pressure sensitive tape, UL approved.

- C. Machine-fabricate glass fiber ducts and fittings. Make only minor on site manual adjustments.
- D. Staple duct joints and tape with 3 inch (75 mm) wide 2 mil (0.05) thick or 2 inch (50 mm) wide 3 mil (0.75 mm) thick aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify sizes of equipment connections before fabricating transitions.

3.2 INSTALLATION

- A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Install glass fiber ducts in accordance with SMACNA Fibrous Glass Duct Construction Standards. Obtain manufacturer's inspection and acceptance of fabrication and installation at beginning of installation.
- C. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Use crimp joints with or without bead or beaded sleeve couplings for joining all round ducts.
- E. Use double nuts and lock washers on threaded rod supports.
- F. Connect flexible ducts to metal ducts with draw bands. Maximum flex duct length 4'.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Install openings in ductwork where required to accommodate thermometers and controllers. Install pitot tube openings for testing of systems. Install pitot tube complete with metal can with spring device or screw to prevent air leakage. Where openings are provided in insulated ductwork, install insulation material inside metal ring.
- B. Connect terminal units to supply ducts directly. Do not use flexible duct to change direction.

3.4 CLEANING

- A. Section 01700 - Execution Requirements: Final cleaning.
- B. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air flow, clean one half of system completely before proceeding to other half. Protect equipment with potential to be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.5 SCHEDULES

DUCTWORK MATERIAL SCHEDULE

AIR SYSTEM	MATERIAL
Supply (Heating Systems)	Galvanized Steel, Aluminum
Supply (System with Cooling Coils)	Galvanized Steel, Aluminum
Return and Relief	Galvanized Steel, Aluminum
General Exhaust	Galvanized Steel, Aluminum
Transfer Air and Sound Boots	Fibrous Glass Duct.

END OF SECTION

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SECTION 23 3300

DUCT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes back-draft dampers, combination fire-and-smoke dampers, duct access doors, fire dampers, smoke dampers, volume control dampers, flexible duct connections and duct test holes.
- B. Related Sections:
 - 1. Division 16 - Wiring Devices: Execution requirements for connection of electrical Combination Smoke and Fire Dampers specified by this section.
 - 2. Section 230900 - HVAC Instrumentation: Execution and Product requirements for connection and control of Combination Smoke and Fire Dampers for placement by this section.

1.2 REFERENCES

- A. NFPA 90A (National Fire Protection Association) - Installation of Air Conditioning and Ventilating Systems.
- B. NFPA 92A (National Fire Protection Association) - Smoke Control Systems.
- C. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards - Metal and Flexible.
- D. UL 33 (Underwriters Laboratories, Inc.) - Heat Responsive Links for Fire-Protection Service.
- E. UL 555 (Underwriters Laboratories, Inc.) - Fire Dampers and Ceiling Dampers.
- F. UL 555S (Underwriters Laboratories, Inc.) - Leakage Rated Dampers for Use in Smoke Control Systems.

1.3 SUBMITTALS

- A. Provide in accordance with the General conditions of the Drawings.
- B. Product Data: Submit data for shop fabricated assemblies including volume control dampers duct access doors and hardware used. Include electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Submit for Fire and Combination Smoke and Fire Dampers.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01700 - Execution Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of access doors and test holes.

- C. Operation and Maintenance Data: Submit for Combination Smoke and Fire Dampers.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.7 COORDINATION

- A. Coordinate Work where appropriate with building control Work.

PART 2 PRODUCTS

2.1 COMBINATION FIRE AND SMOKE DAMPERS

- A. Fabricate in accordance with NFPA 90A, UL 555, and UL 555S.
- B. Multiple-Blade Dampers: Fabricate with 16 gage (1.5 mm) galvanized steel frame and blades. Furnish oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 x 1/2 inch (3.2 x 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.
- C. Operators: UL listed and labeled spring return electric type suitable for 120 volts, single phase, 60 Hz. Furnish end switches to indicate damper position. Locate damper operator on interior or exterior of duct and link to damper operating shaft.
- D. Normally Closed Smoke Responsive Fire Dampers: Curtain type, opening by gravity upon actuation of Electro thermal link, flexible stainless steel blade edge seals to produce constant sealing pressure.
- E. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of Electro thermal link, flexible stainless steel blade edge seals to produce constant sealing pressure, stainless steel springs with locking devices to maintain positive closure for units mounted horizontally.
- F. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.2 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, furnish minimum 1 inch (25 mm) thick insulation with sheet metal cover.
 1. Less Than 12 inches (300 mm) square, secure with sash locks.
 2. Up to 18 inches (450 mm) Square: Furnish two hinges and two sash locks.
 3. Up to 24 x 48 inches (600 x 1200 mm): Three hinges and two compression latches with outside and inside handles.

4. Larger Sizes: Furnish additional hinge.
5. Access panels with sheet metal screw fasteners are not acceptable.

2.3 FIRE DAMPERS

- A. Fabricate in accordance with NFPA 90A and UL 555, and manufacturer's condition of listing. Permanently mark dampers for use in static systems.
- B. Horizontal Dampers: Galvanized steel, 22 gage (0.76 mm) frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
- C. Curtain Type Dampers: Galvanized steel with interlocking blades. Furnish stainless steel closure springs and latches for horizontal installations conditions. Configure with blades out of air stream except for 1.0-inch 250 Pa pressure class ducts up to 12 inches (300 mm) in height.
- D. Multiple Blade Dampers: 16 gage (1.5 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch (3.2 x 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- E. Fusible Links: UL 33, separate at 160 with adjustable link straps for combination fire/balancing dampers.

2.4 VOLUME CONTROL DAMPERS.

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.
- B. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch (200 x 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized frame channel with suitable hardware.
- C. End Bearings: Except in round ductwork 12 inches and smaller, furnish end bearings. On multiple blade dampers, furnish oil-impregnated nylon or sintered bronze bearings. Furnish closed end bearings on ducts having pressure classification over 2 inches wg.
- D. Quadrants:
 1. Furnish locking, indicating quadrant regulators on single and multi-blade dampers.
 2. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters.
 3. Where rod lengths exceed 30 inches (750 mm) furnish regulator at both ends.

2.5 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.
- B. Connector: Fabric crimped into metal edging strip.
 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A, minimum density 30 oz per sq yd.
 2. Net Fabric Width: Approximately 3 inches wide.
 3. Metal: 3 inch wide, 24 gage galvanized steel.

2.6 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Furnish extended neck fittings to clear insulation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify rated walls are ready for fire damper installation.
- B. Verify ducts and equipment installation are ready for accessories.

3.2 INSTALLATION.

- A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 233100 for duct construction and pressure class.
- B. Install duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and as indicated on Drawings. Install minimum 8 x 8 inch (200 x 200 mm) size for hand access, 18 x 18 inch (450 x 450 mm) size for shoulder access, and as indicated on Drawings. Install 4 x 4 inch (100 x 100 mm) for balancing dampers only. Review locations prior to fabrication.
- C. Install duct test holes required for testing and balancing purposes.
- D. Provide fire dampers, combination fire and smoke dampers at locations as indicated on Drawings. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- E. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.

3.3 DEMONSTRATION AND TRAINING

- A. Demonstrate re-setting of fire dampers to Owner's representative.

END OF SECTION

SECTION 23 3600

AIR TERMINAL UNITS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes constant volume terminal units, variable volume terminal units, fan powered terminal units, variable volume regulators, integral sound attenuation, integral heating coils, integral damper motor operators, integral controls.
- B. Related Sections:
 - 1. Section 230923 – Direct Digital Control System.

1.2 REFERENCES

- A. NFPA 90A (National Fire Protection Association) - Installation of Air Conditioning and Ventilation Systems.
- B. UL 181 (Underwriters Laboratories, Inc.) - Factory-Made Air Ducts and Connectors.

1.3 SUBMITTALS

- A. Provide in accordance with the General Conditions of the Contract.
- B. Product Data: Submit data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings indicating airflow, static pressure, and NC designation. Include electrical characteristics and connection requirements. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of 1 inch to 4 inches wg (250 to 1000 Pa).
- C. Manufacturer's Installation Instructions: Submit support and hanging details, and service clearances required.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant volume regulators.

1.5 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.6 COORDINATION

- A. Coordinate Work with 15910 – Direct Digital Control System.

PART 2 PRODUCTS

2.1 AIR TERMINAL UNITS

- A. Manufacturers: Price, Titus, & Tuttle & Bailey.
- B. Ceiling mounted variable air volume fan powered supply air control terminals for connection to single duct, central air systems, with electronic variable volume controls, hot water heating coils.
- C. Identify each terminal unit with identification label and airflow indicator. Include unit nominal airflow, maximum factory-set airflow and minimum factory-set airflow and coil type.

2.2 SINGLE DUCT VARIABLE VOLUME AND VAV REHEAT UNITS

- A. Basic Assembly:
 - 1. Casings: Minimum 22 gage galvanized steel.
 - 2. Lining: Minimum 1 inch thick neoprene or vinyl coated glass fiber insulation, 1.5 lb./cu ft (24 g/L) density, meeting NFPA 90A requirements and UL 181 erosion requirements.
 - 3. Plenum Air Inlets: Round stub connections for duct attachment.
 - 4. Plenum Air Outlets: S slip-and-drive connections.
- B. Basic Unit:
 - 1. Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud.
 - 2. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings; maximum damper leakage: 2 percent of design air flow at 1 inch inlet static pressure.
 - 3. Mount damper operator to position damper normally open.
- C. Hot Water Heating Coil:
 - 1. Construction: 1/2 inch (13 mm) copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig (10380 kPa) pressure, factory installed.
 - 2. Capacity: As indicated on Drawings.
 - 3. All coils are to be 2 row.
- D. Automatic Damper Operator:
 - 1. Refer to Section 230923 – Direct Digital Control System.
- E. Thermostat: Refer to Section 230923.

2.3 FAN POWERED VARIABLE VOLUME UNITS

- A. Basic Assembly:
 - 1. Casings: Minimum 22 gage galvanized steel.
 - 2. Lining: Minimum 1 inch thick neoprene or vinyl coated glass fiber insulation, 1.5 lb./cu ft (24 g/L) density, meeting NFPA 90A requirements and UL 181 erosion requirements.
 - 3. Plenum Air Outlets: S-slip and drive connections.
- B. Basic Unit:

1. Configuration: Air volume damper assembly and fan in parallel arrangement inside unit casing. Locate control components inside protective metal shroud.
 2. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings; maximum damper leakage: 2 percent of design air flow at 1 inch rated inlet static pressure.
 3. Mount damper operator to position damper normally open.
- C. Automatic Damper Operator:
- D. Fan Assembly
1. Fan: Forward curved centrifugal type with direct drive permanent-split-capacitor type, thermally protected motor.
 2. Speed Control: Infinitely adjustable with and electronic controls.
 3. Isolation: Fan/motor assembly on rubber isolators.
- E. Hot Water Heating Coil:
1. Construction: 1/2 inch (13 mm) copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig (10 380 kPa) pressure, factory installed.
 2. Capacity: As scheduled on Drawings.
 3. All coils are to be 2 row.
- F. Wiring
1. Factory mount and wire controls. Mount electrical components in control box with removable cover. Incorporate single point electrical connection to power source.
 2. Factory mount transformer for control voltage on electric and electronic control units. Furnish terminal strip in control box for field wiring of thermostat and power source.
 3. Wiring Terminations: Wire fan and controls to terminal strip. Furnish terminal lugs to match branch-circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box.
 4. Disconnect Switch: Factory mount disconnect switch.
- G. Controls:
1. Refer to Section 230923.
- H. Thermostat:
1. Refer to Section 2309023.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify ductwork is ready to receive Work.

3.2 INSTALLATION

- A. Connect to ductwork in accordance with Section 233100.
- B. Install ceiling access doors or locate units above easily removable ceiling components.
- C. Support units individually from structure. Do not support from adjacent ductwork.

- D. Install lined ductwork downstream of units.

3.3 ADJUSTING

- A. Section 230593 - Execution Requirements: Testing, adjusting, and balancing.
- B. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to 0 percent full flow. Set units with heating coils for minimum 50 percent full flow.

END OF SECTION

SECTION 23 3700

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes diffusers, registers/grilles, and louvers.

1.2 REFERENCES

- A. ADC 1062 (Air Diffusion Council) - Certification, Rating and Test Manual.
- B. AMCA 500 (Air Movement and Control Association) - Test Method for Louvers, Dampers and Shutters.
- C. ASHRAE 70 (American Society of Heating, Refrigerating and Air Conditioning Engineers) - Method of Testing for Rating the Airflow Performance of Outlets and Inlets.
- D. SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) - HVAC Duct Construction Standard - Metal and Flexible.

1.3 SUBMITTALS

- A. Provide as per the General Conditions.
- B. Product Data: Submit data outlets and inlets sizes, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.1 CEILING DIFFUSERS

- A. Manufacturers: Price, Air diffusion products.
- B. Type: As scheduled on the Drawings
- C. Fabrication: Aluminum extrusions with factory baked enamel finish, color to be selected.
- D. Frame: 1-1/4 inch margin with countersunk screw support clips for suspension system support clips for T bar mounting and gasket Coordinate with ceiling type as shown on Architectural Drawings.
- E. Plenum: Integral, galvanized steel, insulated.

2.2 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES (PERFORATED FACE)

- A. Manufacturers: Titus, Price, Tempo, Tuttle & Bailey, Air Diffusion Products.
- B. Type: Perforated and removable face as scheduled on the Drawings.

- C. Coordinate mounting frame with ceiling type indicated on the Drawings.
- D. Fabrication: Steel with steel or aluminum frame.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify inlet/outlet locations.
- B. Verify ceiling and wall systems are ready for installation.

3.2 INSTALLATION

- A. Install diffusers to ductwork with airtight connection.
- B. Install balancing dampers on duct take-off to diffusers, grilles, and registers, whether or not dampers are furnished as part of diffuser, grille, and register assembly.
- C. Paint visible portion of ductwork behind air outlets and inlets matte black.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

3.4 SCHEDULES

END OF SECTION

SECTION 23 4000

AIR CLEANING DEVICES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Disposable Panel Filters
 - 2. Extended Surface Filters
- B. Related Sections:
 - 1. Section 23 36 00 - Air Terminal Units
 - 2. Section 23 37 00 - Air Outlets and Inlets

1.02 SUBMITTALS

- A. Submit "Letter of Conformance" in accordance with Section 01 33 00 indicating specified items selected for use in Project with the following supporting data:
 - 1. Product Data:
 - a. Include dimensions; shipping, installed, and operating weights; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each model indicated.
 - 2. Maintenance Data: For each type of filter and rack to include in maintenance manuals specified in Division 01. Reference Section 01 78 23 "Operation and Maintenance Data" for additional requirements.

1.03 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of air filters and are based on the specific system indicated.
- B. Comply with NFPA 90A and NFPA 90B.
- C. ASHRAE Compliance: Comply with provisions of ASHRAE 52.1 for method of testing and rating efficiency, arrestance, and dust holding capacity.
- D. Underwriters Laboratories, Inc. (UL): Comply with UL Standards pertaining to safety and performance of air filter units including UL 900 "Test Performance of Air Filter Units."

1.04 EXTRA MATERIALS

- A. Furnish extra materials described in Section 01 78 43 "Spare Parts and Materials" that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Approved Manufacturers:
 - 1. Air Filters, Electrostatic Air Cleaners, and Filter-Holding Systems:
 - 2. [AAF International](#)
 - 3. [Camfil Farr](#)
 - 4. [International Air Filter, Inc.](#)

2.02 DISPOSABLE PANEL FILTERS

- A. Description: Factory-fabricated, viscous-coated, flat-panel type, disposable air filters with holding frames.
- B. Media: Interlaced glass fibers sprayed with nonflammable adhesive.
- C. Frame: Cardboard frame with perforated metal retainer.
- D. Duct-Mounting Frames: Welded, galvanized steel with gaskets and fasteners and suitable for bolting together into built-up filter banks.

2.03 EXTENDED-SURFACE, DISPOSABLE PANEL FILTERS

- A. Description: Factory-fabricated, dry, one 2-inch extended-surface filters with holding frames.
- B. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
- C. Media and Media-Grid Frame: Nonflammable rigid drip board frame with expanded metal support cross braced on both sides of filter media.
- D. Media and Media-Grid Frame: Galvanized steel.
- E. Duct-Mounting Frames: Welded, galvanized steel with gaskets and fasteners, and suitable for bolting together into built-up filter banks.

PART 3 EXECUTION

- A. Install filter frames according to manufacturer's written instructions.
- B. Position each filter unit with clearance for normal service and maintenance. Anchor filter holding frames to substrate.
- C. Install filters in position to prevent passage of unfiltered air. Joints between filter frames and enclosing ductwork shall be gasketed and sealed against air leakages.
- D. Coordinate filter installations with duct and air-handling unit installations.

3.02 CLEANING

- A. After completing system installation and testing, adjusting, and balancing air-handling and air-distribution systems, clean filter housings and install new filter media.

END OF SECTION

DIVISION 24 thru DIVISION 25

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DIVISION 26 - ELECTRICAL

Section 26 0500	Common Work Results for Electrical
Section 26 0519	Conductors and Cables
Section 26 0526	Grounding and Bonding for Electrical Systems
Section 26 0533	Raceways and Boxes for Electrical Systems
Section 26 0548	Vibration and Seismic Controls for Electrical Systems
Section 26 0923	Lighting Control Devices
Section 26 2726	Wiring Devices
Section 26 5100	Interior Lighting

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SECTION 26 0500

COMMON WORK RESULTS FOR ELECTRICAL

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. Supporting devices for electrical components.
 2. Electrical identification.
 3. Electrical demolition.
 4. Cutting and patching for electrical construction.
 5. Touchup painting.

1.3 SUBMITTALS

- A. Product Data: For electricity-metering equipment.
- B. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

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 NFPA 70.

1.5 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

- C. Coordinate electrical service connections to components furnished by utility companies.
 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
 2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
- D. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- E. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs.
- D. Slotted-Steel Channel Supports: Comply with Division 5 Section "Metal Fabrications" for slotted channel framing.
 1. Channel Thickness: Selected to suit structural loading.
 2. Fittings and Accessories: Products of the same manufacturer as channel supports.
- E. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- F. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- G. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- H. Expansion Anchors: Carbon-steel wedge or sleeve type.
- I. Toggle Bolts: All-steel springhead type.
- J. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 ELECTRICAL IDENTIFICATION

- A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

- B. Raceway and Cable Labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.
 - 1. Type: Pretensioned, wraparound plastic sleeves. Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the item it identifies.
 - 2. Type: Preprinted, flexible, self-adhesive, vinyl. Legend is overlaminated with a clear, weather- and chemical-resistant coating.
 - 3. Color: Black letters on orange background.
 - 4. Legend: Indicates voltage.
- C. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.
- D. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- E. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- F. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.
- G. Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.
- H. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.3 TOUCHUP PAINT

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Dry Locations: Steel materials.
- B. Support Clamps for PVC Raceways: Click-type clamp system.
- C. Selection of Supports: Comply with manufacturer's written instructions.
- D. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.3 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- F. Install 1/4-inch- diameter or larger threaded steel hanger rods, unless otherwise indicated.
- G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I. Simultaneously install vertical conductor supports with conductors.
- J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
- K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

- M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
1. Wood: Fasten with wood screws or screw-type nails.
 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 3. New Concrete: Concrete inserts with machine screws and bolts.
 4. Existing Concrete: Expansion bolts.
 5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
 6. Steel: Welded threaded studs or spring-tension clamps on steel.
 - a. Field Welding: Comply with AWS D1.1.
 7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
 8. Light Steel: Sheet-metal screws.
 9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- E. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
1. Phase A: Black.
 2. Phase B: Red.
 3. Phase C: Blue.
- F. Color-code 480/277-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
1. Phase A: Yellow.
 2. Phase B: Brown.
 3. Phase C: Orange.
- G. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- H. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

- I. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch- high lettering on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:
 1. Panelboards, electrical cabinets, and enclosures.
 2. Emergency system boxes and enclosures.
 3. Disconnect switches.
 4. Enclosed circuit breakers.
 5. Push-button stations.
 6. Power transfer equipment.
 7. Contactors.
 8. Remote-controlled switches.
 9. Fire alarm master station or control panel.
 10. Security-monitoring master station or control panel.

3.5 FIRESTOPPING

- A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

3.6 DEMOLITION

- A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
- C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- D. Remove demolished material from Project site.
- E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.7 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.8 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
 - 1. Supporting devices for electrical components.
 - 2. Electrical identification.
 - 3. Electricity-metering components.
 - 4. Concrete bases.
 - 5. Electrical demolition.
 - 6. Cutting and patching for electrical construction.
 - 7. Touchup painting.

3.9 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."
 - 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
 - 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
 - 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.10 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 260500

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SECTION 26 0519

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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 building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field Quality-Control Test Reports: From Contractor.

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 NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

- A. Manufacturers:
 - 1. American Insulated Wire Corp.; a Leviton Company.
 - 2. General Cable Corporation.
 - 3. Senator Wire & Cable Company.
 - 4. Southwire Company.
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

- C. Conductor Material: Copper complying with NEMA WC 7; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- D. Conductor Insulation Types: Type THHN-THWN, XHHW and SO complying with NEMA WC 7.
- E. Multiconductor Cable: Not allowed.

2.3 CONNECTORS AND SPLICES

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. AMP Incorporated/Tyco International.
 - 3. Hubbell/Anderson.
 - 4. O-Z/Gedney; EGS Electrical Group LLC.
 - 5. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

- A. Feeders: Type THHN-THWN, single conductors in raceway.
- B. Branch Circuits: Type THHN-THWN, single conductors in raceway.
- C. Minimum Branch Circuit Conductor Size: Provide the following minimum sizes for distances listed on 20A branch circuits to prevent excessive voltage drop. The circuit length shall be measured along the length of the conductor from the circuit breaker in the panelboard to the last device on the circuit. If required, increase raceway size to comply with conductor fill requirements of NFPA 70.
 - 1. Branch Circuit Voltage of 120V:
 - a. Circuit lengths less than 70 feet: Provide minimum #12 AWG conductor size.
 - b. Circuit lengths between 70 feet and 110 feet: Provide minimum #10 AWG conductor size.
 - c. Circuit lengths between 110 feet and 170 feet: Provide minimum #8 AWG conductor size.
 - d. Circuit lengths greater than 170 feet: Perform voltage drop calculations and provide conductor size to keep branch circuit voltage drop less than 3% with a 15 amp load.
 - 2. Branch Circuit Voltage of 277V:
 - a. Circuit lengths less than 150 feet: Provide minimum #12 AWG conductor size.
 - b. Circuit lengths between 150 feet and 240 feet: Provide minimum #10 AWG conductor size.
 - c. Circuit lengths between 240 feet and 380 feet: Provide minimum #8 AWG conductor size.
 - 3. Circuit lengths greater than 380 feet: Perform voltage drop calculations and provide conductor size to keep branch circuit voltage drop less than 3% with a 15 amp load.
- D. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.

- E. Fire Alarm Circuits: Type THHN-THWN, in raceway.
- F. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- G. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.2 INSTALLATION

- 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 26 Section "Common Work Results for Electrical."
- F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."
- G. Identify and color-code conductors and cables according to Division 26 Section "Common Work Results for Electrical."

3.3 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.
- 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 12 inches of slack.

3.4 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
 - 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. 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.

END OF SECTION 260519

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 SUBMITTALS

- A. Field Test Reports: Submit written test reports to include the following:
 1. Test procedures used.
 2. Test results that comply with requirements.
 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

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.
 1. Comply with UL 467.
- B. Comply with NFPA 70; for medium-voltage underground construction, comply with IEEE C2.
- C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Grounding Conductors, Cables, Connectors, and Rods:
 - a. Apache Grounding/Erico Inc.
 - b. Boggs, Inc.
 - c. Chance/Hubbell.
 - d. Copperweld Corp.
 - e. Dossert Corp.
 - f. Erico Inc.; Electrical Products Group.
 - g. Framatome Connectors/Burndy Electrical.
 - h. Galvan Industries, Inc.

- i. Harger Lightning Protection, Inc.
- j. Hastings Fiber Glass Products, Inc.
- k. Heary Brothers Lightning Protection Co.
- l. Ideal Industries, Inc.
- m. ILSCO.
- n. Kearney/Cooper Power Systems.
- o. Korn: C. C. Korn Co.; Division of Robroy Industries.
- p. Lightning Master Corp.
- q. Lyncole XIT Grounding.
- r. O-Z/Gedney Co.; a business of the EGS Electrical Group.
- s. Raco, Inc.; Division of Hubbell.
- t. Robbins Lightning, Inc.
- u. Salisbury: W. H. Salisbury & Co.
- v. Superior Grounding Systems, Inc.
- w. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 26 Section "Low Voltage Power Conductors and Cables."
- B. Material: Copper.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation.
- D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- E. Grounding Electrode Conductors: Stranded cable.
- F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- G. Bare Copper Conductors: Comply with the following:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Assembly of Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
- H. Copper Bonding Conductors: As follows:
 - 1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
 - 2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
 - 3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
- D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
 - 2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.

3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits.
- C. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.
- D. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.
- E. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

- B. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

3.4 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- C. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- D. Tighten screws and bolts for grounding and bonding 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.
- E. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- F. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

END OF SECTION 260526

SECTION 26 0533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Refer to Division 27 Specifications Sections for all requirements for low-voltage raceways and boxes.

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

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. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. Alflec Inc.
 - 3. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 4. Electri-Flex Co.
 - 5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
 - 6. LTV Steel Tubular Products Company.
 - 7. Manhattan/CDT/Cole-Flex.
 - 8. O-Z Gedney; Unit of General Signal.
 - 9. Wheatland Tube Co.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. IMC: ANSI C80.6.
- D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.
- E. Plastic-Coated IMC and Fittings: NEMA RN 1.
- F. EMT and Fittings: ANSI C80.3.
 - 1. Fittings: Set-screw or compression type.
- G. FMC: Zinc-coated steel.
- H. LFMC: Flexible steel conduit with PVC jacket.
- I. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers:
 - 1. American International.
 - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 3. Arco Corp.
 - 4. Cantex Inc.
 - 5. Certainteed Corp.; Pipe & Plastics Group.
 - 6. Condux International.
 - 7. ElecSYS, Inc.
 - 8. Electri-Flex Co.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Manhattan/CDT/Cole-Flex.

11. RACO; Division of Hubbell, Inc.
12. Spiralduct, Inc./AFC Cable Systems, Inc.
13. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

2.4 METAL WIREWAYS

A. Manufacturer:

1. Hoffman.
2. Square D.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1 or 3R.

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. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Hinged type.

F. Finish: Manufacturer's standard enamel finish.

2.5 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard color as selected by the Architect.

1. Manufacturers:
 - a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
 - b. Thomas & Betts Corporation.
 - c. Walker Systems, Inc.; Wiremold Company (The).
 - d. Wiremold Company (The); Electrical Sales Division.

B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet-PLM Division.
10. Spring City Electrical Manufacturing Co.
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, Type FD, with gasketed cover.
- D. Floor Boxes: Cast metal, fully adjustable, rectangular.
- E. Floor Boxes: Nonmetallic, nonadjustable, round.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
- I. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.7 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Indoors:
 - 1. Exposed: EMT, rigid steel where subject to physical damage.
 - 2. Concealed: EMT.
 - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
 - 4. Damp or Wet Locations: Rigid steel conduit.
 - 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- B. Minimum Raceway Size: 3/4-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
- D. Do not install aluminum conduits embedded in or in contact with concrete.

3.2 INSTALLATION

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 26 Section "Common Work Results for Electrical."
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - 1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- I. Join raceways with fittings designed and approved for that purpose and make joints tight.
 - 1. Use insulating bushings to protect conductors.
- J. Tighten set screws of threadless fittings with suitable tools.
- K. Terminations:
 - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- L. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- M. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

- N. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- O. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- P. Set floor boxes level and flush with finished floor surface.
- Q. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 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.

3.4 CLEANING

- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 260533

SECTION 26 0548

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes seismic restraints and other earthquake-damage-reduction measures for electrical components. It complements optional seismic construction requirements in the various electrical component Sections. Electrical components included, but are not limited to:
 - 1. Electrical distribution gear.
 - 2. Pendant lighting fixtures.
 - 3. Raceway and cable tray systems.

1.3 DEFINITIONS

- A. IBC: International Building Code.
- B. Seismic Restraint: A fixed device (a seismic brace, an anchor bolt or stud, or a fastening assembly) used to prevent vertical or horizontal movement, or both vertical and horizontal movement, of an electrical system component during an earthquake.
- C. Mobile Structural Element: A part of the building structure such as a slab, floor structure, roof structure, or wall that may move independent of other mobile structural elements during an earthquake.

1.4 SUBMITTALS

- A. Product Data: Illustrate and indicate types, styles, materials, strength, fastening provisions, and finish for each type and size of seismic restraint component used.
 - 1. Anchor Bolts and Studs: Tabulate types and sizes, complete with report numbers and rated strength in tension and shear as evaluated by an agency approved by authorities having jurisdiction.
- B. Shop Drawings: For anchorage and bracing not defined by details and charts on Drawings. Indicate materials, and show designs and calculations signed and sealed by a professional engineer.
 - 1. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
 - 2. Details: Detail fabrication and arrangement. Detail attachment of restraints to both structural and restrained items. Show attachment locations, methods, and spacings,

identifying components and listing their strengths. Indicate direction and value of forces transmitted to the structure during seismic events.

3. Preapproval and Evaluation Documentation: By an agency approved by authorities having jurisdiction, showing maximum ratings of restraints and the basis for approval (tests or calculations).
- C. Coordination Drawings: Plans and sections drawn to scale and coordinating seismic bracing for electrical components with other systems and equipment, including other seismic restraints, in the vicinity.
- D. Product Certificates: Signed by manufacturers of seismic restraints certifying that products furnished comply with requirements.
- E. Material Test Reports: From a qualified testing agency indicating and interpreting test results of seismic control devices for compliance with requirements indicated.

1.5 QUALITY ASSURANCE

- A. Comply with seismic restraint requirements in IBC, unless requirements in this Section are more stringent.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing seismic engineering services, including the design of seismic restraints, that are similar to those indicated for this Project.

1.6 PROJECT CONDITIONS

- A. Project Seismic Zone and Zone Factor as Defined in IBC: Select categories and factors in two paragraphs below in coordination with structural engineer.
- B. Occupancy Category as Defined in IBC: As defined by Structural Engineer.
- C. Acceleration Factor: As defined by Structural Engineer.

1.7 COORDINATION

- A. Coordinate layout and installation of seismic bracing with building structural system and architectural features, and with mechanical, fire-protection, electrical, and other building features in the vicinity.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Amber/Booth Company, Inc.
 2. B-Line Systems, Inc.

3. Erico, Inc.
4. GS Metals Corp.
5. Loos & Company, Inc.
6. Mason Industries, Inc,
7. Powerstrut.
8. Thomas & Betts Corp.
9. Unistrut Corporation.

2.2 MATERIALS

- A. Use the following materials for restraints:
1. Indoor Dry Locations: Steel, zinc plated.
 2. Outdoors and Damp Locations: Galvanized steel.
 3. Corrosive Locations: Stainless steel.

2.3 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

- A. Strength: Defined in reports by ICBO Evaluation Service or another agency acceptable to authorities having jurisdiction.
1. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.
- B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type.
- C. Concrete Inserts: Steel-channel type.
- D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.
- E. Welding Lugs: Comply with MSS SP-69, Type 57.
- F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.
- G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.
- H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

2.4 SEISMIC BRACING COMPONENTS

- A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch- thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.
1. Materials for Channel: ASTM A 570, GR 33.
 2. Materials for Fittings and Accessories: ASTM A 575, ASTM A 576, or ASTM A 36.
 3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.

4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.
- B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.
- C. Cable-Type Bracing Assemblies: Zinc-coated, high-strength steel wire rope cable attached to steel thimbles, brackets, and bolts designed for cable service.
 1. Arrange units for attachment to the braced component at one end and to the structure at the other end.
 2. Wire Rope Cable: Comply with ASTM 603. Use 49- or 133-strand cable with a minimum strength of 2 times the calculated maximum seismic force to be resisted.
- D. Hanger Rod Stiffeners: Slotted steel channels with internally bolted connections to hanger rod.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install seismic restraints according to applicable codes and regulations and as approved by authorities having jurisdiction, unless more stringent requirements are indicated.

3.2 STRUCTURAL ATTACHMENTS

- A. Use bolted connections with steel brackets, slotted channel, and slotted-channel fittings to spread structural loads and reduce stresses.
- B. Attachments to New Concrete: Bolt to channel-type concrete inserts or use expansion anchors.
- C. Attachments to Existing Concrete: Use expansion anchors.
- D. Holes for Expansion Anchors in Concrete: Drill at locations and to depths that avoid reinforcing bars.
- E. Attachments to Solid Concrete Masonry Unit Walls: Use expansion anchors.
- F. Attachments to Hollow Walls: Bolt to slotted steel channels fastened to wall with expansion anchors.
- G. Attachments to Wood Structural Members: Install bolts through members.
- H. Attachments to Steel: Bolt to clamps on flanges of beams or on upper truss chords of bar joists.

3.3 ELECTRICAL EQUIPMENT ANCHORAGE

- A. Anchor rigidly to a single mobile structural element or to a concrete base that is structurally tied to a single mobile structural element.
- B. Anchor panelboards as follows:

1. Anchor Bolt Bushing Assemblies for Wall-Mounted Equipment: Install to allow for resilient media where equipment or equipment-mounting channels are attached to wall.
2. Torque bolts and nuts on studs to values recommended by equipment manufacturer.

3.4 SEISMIC BRACING INSTALLATION

- A. Install bracing according to spacings and strengths indicated by approved analysis.
- B. Expansion and Contraction: Install to allow for thermal movement of braced components.
- C. Cable Braces: Install with maximum cable slack recommended by manufacturer.
- D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to the structure at flanges of beams, upper truss chords of bar joists, or at concrete members.

3.5 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Make flexible connections in raceways, cables, wireways, cable trays, and busways where they cross expansion and seismic control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate at electrical equipment anchored to a different mobile structural element from the one supporting them.

END OF SECTION 260548

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SECTION 26 0923

LIGHTING CONTROL DEVICES

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 lighting control devices:
 - 1. Outdoor and indoor photoelectric switches.
 - 2. Indoor occupancy sensors.
 - 3. Multipole contactors.
- B. Related Sections include the following:
 - 1. Division 26 Section "Lighting Controls" for low-voltage, manual and programmable lighting control systems.
 - 2. Division 26 Section "Wiring Devices" for wall-box dimmers and manual light switches.

1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. PIR: Passive infrared.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
 - 1. Lighting plan showing location, orientation, and coverage area of each sensor.
 - 2. Interconnection diagrams showing field-installed wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

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.

1.6 COORDINATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

- A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

2.3 INDOOR OCCUPANCY SENSORS

- A. Manufacturers:
 - 1. Hubbell Lighting Inc.
 - 2. Leviton Mfg. Company Inc.
 - 3. Lithonia Lighting.
 - 4. Novitas, Inc.
 - 5. Sensor Switch, Inc.
 - 6. Watt Stopper (The).
- B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.
 - 1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - 2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 - 3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
 - 4. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 - 5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
 - 6. Bypass Switch: Override the on function in case of sensor failure.
 - 7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keeps lighting off when selected lighting level is present.

- C. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.
 - 1. Sensitivity Adjustment: Separate for each sensing technology.
 - 2. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in., and detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 - 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.4 MULTIPOLE CONTACTORS

- A. Manufacturers:
 - 1. Allen-Bradley/Rockwell Automation.
 - 2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
 - 3. Cutler-Hammer; Eaton Corporation.
 - 4. GE Industrial Systems; Total Lighting Control.
 - 5. Grasslin Controls Corporation.
- B. Description: Electrically operated and mechanically held, complying with NEMA ICS 2 and UL 508.
 - 1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
 - 2. Control-Coil Voltage: Match control power source.

2.5 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG, complying with Division 26 Section "Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. 18 AWG, complying with Division 26 Section "Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. 14 AWG, complying with Division 26 Section "Conductors and Cables."
- D. Install unshielded, twisted-pair cable for control and signal transmission conductors, complying with Division 26 Section "Voice and Data Communication Cabling."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve at least 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions. Mount per manufacturer's coverage criteria. Monitor typical area, not any particular desktop.

3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 26 Section "Conductors and Cables." Minimum conduit size shall be 1/2 inch.
- B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Install field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.
- D. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
- F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Common Work Results for Electrical."
- B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - 2. Operational Test: Verify actuation of each sensor and adjust time delays.
- B. Remove and replace lighting control devices where test results indicate that they do not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose.

END OF SECTION 260923

SECTION 26 2726

WIRING DEVICES

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. Single and duplex receptacles, ground-fault circuit interrupters, and isolated-ground receptacles.
 2. Single- and double-pole snap switches and dimmer switches.
 3. Device wall plates.
 4. Pin and sleeve connectors and receptacles.
 5. Floor service outlets, poke-through assemblies, and multioutlet assemblies.

1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.

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.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.
- 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: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wiring Devices:
 - a. Bryant Electric, Inc./Hubbell Subsidiary.
 - b. Eagle Electric Manufacturing Co., Inc.
 - c. Hubbell Incorporated; Wiring Device-Kellems.
 - d. Leviton Mfg. Company Inc.
 - e. Pass & Seymour/Legrand; Wiring Devices Div.
 - 2. Multioutlet Assemblies:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Wiremold Company (The).
 - 3. Poke-Through, Floor Service Outlets:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Pass & Seymour/Legrand; Wiring Devices Div.
 - c. Square D/Groupe Schneider NA.
 - d. Thomas & Betts Corporation.
 - e. Wiremold Company (The).

2.2 RECEPTACLES

- A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
- B. Straight-Blade and Locking Receptacles: Heavy-Duty grade.
- C. GFCI Receptacles: Straight blade, non-feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.
- D. Tamper-Resistant Convenience Receptacles, 125 V, 20 A, heavy-duty grade (marked "Vandal Proof" on the drawings) Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498. Arranged so that power is not available if an object is inserted into an individual slot.

2.3 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.

2.4 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.

2.5 SWITCHES

- A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
- B. Snap Switches: Heavy-Duty grade, quiet type.
- C. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.
 - 1. Control: Continuously adjustable slider; with single-pole or three-way switching to suit connections.
 - 2. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable rotary knob, toggle switch, or slider; single pole with soft tap or other quiet switch; EMI/RFI filter to eliminate interference; and 5-inch (130-mm) wire connecting leads; 1,500 watt minimum rating.
 - 3. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.6 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
 - 3. Material for Detention Areas (Marked "Vandal Proof" on Drawings): 14-gauge zinc-plated steel with baked enamel finish; stainless steel tamper-proof screws.
 - 4. Material for Unfinished Spaces: Galvanized steel.
 - 5. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.7 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
 - 1. Suitable for hard floor or raised access floor as indicated.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular, solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks. Coordinate type with voice/data installer.

2.8 POKE-THROUGH ASSEMBLIES

- A. 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.
 - 1. Service Outlet Assembly: Flush type with four simplex receptacles and space for four RJ-45 jacks.
 - 2. Size: Selected to fit nominal 3-inch (75-mm) cored holes in floor and matched to floor thickness.
 - 3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
 - 4. Closure Plug: Arranged to close unused 3-inch (75-mm) cored openings and reestablish fire rating of floor.
 - 5. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors; and a minimum of four, 4-pair, Category 6 voice and data communication cables.

2.9 MULTIOUTLET ASSEMBLIES

- A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- B. Raceway Material: Metal, with manufacturer's standard finish.
- C. Wire: No. 12 AWG.

2.10 FINISHES

- A. Color:
 - 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70.
 - 2. Wiring Devices Connected to Emergency Power System: Red.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Install wall dimmers to achieve indicated rating after derating for ganging according to manufacturer's written instructions.
- C. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.
- D. 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.
- E. Remove wall plates and protect devices and assemblies during painting.
- F. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

- A. Comply with Division 26 Section "Common Work Results For Electrical."
 - 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 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding."
- B. Connect wiring according to Division 26 Section "Conductors and Cables."
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
 - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

WIRING DEVICE SCHEDULE

Note to Bidders: Comply with Section 262726 of the specifications. The catalog numbers listed below have been carefully prepared with the assistance of the manufacturer's representatives with the objective of assisting the bidders in determining the quality and ratings of the wiring device specified; however, the catalog numbers may not be complete or accurate. In addition, the color of the wiring device is not intended to be determined by the catalog numbers listed below, but shall be selected by the Architect as indicated in the specification. Each manufacturer prior to bidding shall compare catalog numbers shown with the description and shall notify the Architect/Engineer of any discrepancies. Equivalent products will be considered if submitted to the Engineer for review prior to bidding.

NEMA	DESCRIPTION	CATALOG NUMBERS
NEMA 5-20R	20A, 125V 2 pole 3 wire duplex grounding receptacles. Nylon or Lexan Faces. Back and side wired. Comply with FS W-C-596 and UL 498.	Bryant 5352 Hubbell CR5352 Leviton 5352 P&S 5352
NEMA 5-20R GFCI	20A, 125V 2 pole 3 wire duplex feed thru GFCI receptacles with indicator light. Nylon or Lexan decorator faces. Back and side wired. Internal components shall comply with FS W-C-596 where applicable. Comply with UL 498 and UL 493.	Bryant GFR53FT Hubbell GF5352 Leviton 6898 P&S 2091 S

NEMA 5-20R Waterproof (Weatherproof in use)	20A, 125V 2 pole 3 wire duplex GFCI grounding receptacles. Nylon or Lexan Faces. Back and side wired. Comply with FS W-C-596 and UL 498. Fully gasketed weatherproof while in use enclosure.	Hubbell CR5352/5051-0
20A Single Pole	20A single pole 125V-277V standard toggle switch labeled as complying UL standard 20 and with Federal Specification W-S-896. Provide Nylon or Lexan face, back and side wired. Rated 1 HP 120V.	Hubbell CS1221 Leviton 1221 P & S 521 Bryant 4901
20A Three-way	20A three-way 125V-277V standard toggle switch labeled as complying UL standard 20 and with Federal Specification W-S-896. Provide Nylon or Lexan face, back and side wired. Rated 1 HP 120V.	Hubbell CS1223 Leviton 1223 P & S 523 Bryant 4903
20A Four-way	20A four-way 125V-277V standard toggle switch labeled as complying UL standard 20 and with Federal Specification W-S-896. Provide Nylon or Lexan face, back and side wired. Rated 1 HP 120V.	Hubbell CS1224 Leviton 1224 P & S 524 Bryant 4904
PT1	Fire rated poke-thru: four simplex power receptacles with spring loaded lift cover flaps space for four RJ-45 voice/data jacks. Thru floor fitting shall fit in 3" or 4" diameter hole and shall be rated for floor penetrated. Provide carpet flange. Provide conduit adapter for communications conduits.	Hubbell S1PT4X4XX Wiremold RC9A15TCX-LJB
PT4	Fire rated poke-thru: 6" recessed multi-service A/V pole-thru. Shall fit in 6" diameter hole and shall be rated for floor penetrated. Metal trim as selected by Architect; Provide two duplex outlets and one single-gang blank outlets for Owner's voice/data jacks. Provide carpet flange.	Wiremold 6ATCPXX
PT2	Fire rated poke-thru: 3/4" opening for 8-wire furniture power connection and 1-1/4" opening for communications wiring. Thru floor fitting shall fit in 4" diameter hole and shall be rated for floor penetrated. Provide carpet flange.	Wiremold 4FFATCXX-LJB

END OF SECTION 262726

SECTION 26 5100

INTERIOR LIGHTING

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. Interior lighting fixtures with lamps and ballasts.
 - 2. Lighting fixtures mounted on exterior building surfaces.
 - 3. Emergency lighting units.
 - 4. Exit signs.
- B. Related Sections include the following:
 - 1. Division 26 Section "Lighting Controls" for manual or programmable control systems employing low-voltage control wiring or data communication circuits.
 - 2. Division 26 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.
 - 3. Division 26 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

- A. BF: Ballast factor. Ratio of light output of a given lamp(s) operated by the subject ballast to the light output of the same lamp(s) when operated on an ANSI reference circuit.
- B. CRI: Color rendering index.
- C. CU: Coefficient of utilization.
- D. LER: Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:
 - 1. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.
- E. RCR: Room cavity ratio.

1.4 SUBMITTALS

- A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of fixture, including dimensions and verification of indicated parameters.
 - 2. Emergency lighting unit battery and charger.

3. Fluorescent and high-intensity-discharge ballasts.
 4. Lamps.
- B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. Manufacturer Seismic Qualification Certification: Submit certification that lighting fixtures, accessories, and components will withstand seismic forces defined in Division 26 Section "Seismic Controls for Electrical Work." 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 unit will remain in place without separation of any parts from the device when subjected to the seismic forces."
 2. Detailed description of fixture anchorage devices on which the certification is based and their installation requirements.
- D. Wiring Diagrams: Power, signal, and control wiring.
- E. Coordination Drawings: Reflected ceiling plan(s) and other details, 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. Suspended ceiling components.
 2. Structural members to which lighting-fixture suspension systems will be attached.
 3. Other items in finished ceiling, including the following:
 - a. Air outlets and inlets.
 - b. Speakers.
 - c. Sprinklers.
 - d. Access panels.
 4. Perimeter moldings.
- F. Samples for Verification (When Requested by Architect): For interior lighting fixtures designated for sample submission in the Interior Lighting Fixture Schedule.
1. Lamps: Specified units installed.
 2. Ballast: 120-V models of specified ballast types.
 3. Accessories: Cords and plugs.
- G. Product Certificates: For each type of ballast for dimmer-controlled fixtures, signed by product manufacturer.
- H. Source quality-control test reports.
- I. Field quality-control test reports.
- J. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Procedures," include the following:
1. Catalog data for each fixture. Include the diffuser, ballast, and lamps installed in that fixture.
- K. Warranties: Special warranties specified in this Section.

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.
- C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.
- D. Mockups (Where Indicated or Requested by Architect): Provide lighting fixtures for room or module mockups. Install fixtures for mockups with power and control connections.
 - 1. Obtain Architect's approval of fixtures for mockups before starting installations.
 - 2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.
- B. Coordinate luminaires, mounting, and wiring with relays, photocells, dimming ballasts and control systems or stations for full function and control wiring.

1.7 WARRANTY

- A. Special Warranty for Emergency Lighting Unit Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
- B. Special Warranty for Fluorescent Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Electronic Ballasts: Five years from date of Substantial Completion.
 - 2. Warranty Period for Electromagnetic Ballasts: Three years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for T8 Fluorescent Lamps: Manufacturer's standard form, made out to Owner and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: One year from date of Substantial Completion.

1.8 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. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
2. Plastic Diffusers and Lenses: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
3. Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 FIXTURES AND COMPONENTS, GENERAL

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Incandescent Fixtures: Comply with UL 1571. Where LER is specified, test according to NEMA LE 5A.
- C. Fluorescent Fixtures: Comply with UL 1570. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- D. HID Fixtures: Comply with UL 1572. Where LER is specified, test according to NEMA LE 5B.
- E. Metal Parts: Free of burrs and sharp corners and edges.
- F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 1. White Surfaces: 85 percent.
 2. Specular Surfaces: 83 percent.
 3. Diffusing Specular Surfaces: 75 percent.
 4. Laminated Silver Metallized Film: 90 percent.
- I. Plastic Diffusers, Covers, and Globes:
 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch minimum unless different thickness is scheduled.
 - b. UV stabilized.
 2. Glass: Annealed crystal glass, unless otherwise indicated.

2.3 FLUORESCENT LAMP BALLASTS

- A. Description: Include the following features, unless otherwise indicated:
1. Designed for type and quantity of lamps indicated at full light output except for emergency lamps powered by in-fixture battery-packs.
 2. Externally fused with slow-blow type rated between 2.65 and 3.0 times the line current.
- B. Electronic ballasts for linear lamps shall include the following features, unless otherwise indicated:
1. Comply with NEMA C82.11.
 2. Programmed Start: Ballasts with two-step lamp starting to extend life of frequently started lamps.
 3. Ballast Factor: Between 0.61 and 0.79, for use in premium-efficient T8 lamp/ballast combinations as specified.
 4. Sound Rating: A.
 5. Total harmonic distortion rating of less than 20 percent according to NEMA C82.11.
 6. Transient Voltage Protection: IEEE C62.41, Category A.
 7. Operating Frequency: 20 kHz or higher.
 8. Lamp Current Crest Factor: Less than 1.7.
 9. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.
- C. Ballasts for compact lamps in recessed fixtures shall have the following features, unless otherwise indicated:
1. Type: Electronic.
 2. Power Factor: 90 percent, minimum.
 3. Flicker: Less than 5 percent.
 4. Lamp Current Crest Factor: Less than 1.7.
 5. Electronic Ballast Operating Frequency: 20 kHz or higher.
 6. Lamp end-of-life detection and shutdown circuit.
 7. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
 8. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
- D. Ballasts for compact lamps in nonrecessed fixtures shall include the following features, unless otherwise indicated:
1. Power Factor: 90 percent, minimum.
 2. Ballast Coil Temperature: 65 deg C, maximum.
 3. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
 4. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
- E. Ballasts for dimmer-controlled fixtures shall comply with general and fixture-related requirements above for electronic ballasts and the following features:
1. Dimming Range: 100 to 5 percent of rated lamp lumens.
 2. Ballast Input Watts: Can be reduced to 20 percent of normal.
 3. Compatibility: Certified by manufacturer for use with specific dimming system indicated.
 4. Basis of design is 2 wire control from ballast (s) to control system or station.
- F. Ballasts for Low-Temperature Environments:
1. Temperatures 0 deg F and Higher: Electronic or electromagnetic type rated for 0 deg F starting temperature.
 2. Temperatures Minus 20 deg F and Higher: Electromagnetic type designed for use with high-output lamps.

2.4 EXIT SIGNS

- A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum of rated lamp life.
- C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - 1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

2.5 FLUORESCENT EMERGENCY LIGHTING FIXTURES

- A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body. Comply with UL 924.
 - 1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
 - 2. Night Light Connection: Operate one fluorescent lamp continuously.
 - 3. Test Switch and Light-Emitting-Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
 - 4. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life.
 - 5. Charger: Fully automatic, solid-state, constant-current type.
- B. Central Type: Factory installed, full light output, fluorescent emergency ballast to operate lamps indicated from a remote emergency power source.
- C. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from light fixture. Comply with UL 924.
 - 1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
 - 2. Night Light Connection: Operate one fluorescent lamp in a remote fixture continuously.
 - 3. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life.
 - 4. Charger: Fully automatic, solid-state, constant-current type.
 - 5. Housing: NEMA 250, Class 1 enclosure.

2.6 FLUORESCENT LAMPS

- A. Low-Mercury Lamps: Comply with Federal toxic characteristic leaching procedure test, and yield less than 0.2 mg of mercury per liter, when tested according to NEMA LL 1.
- B. T8 rapid-start low-mercury lamps, rated 32 W maximum, 3100 initial lumens (minimum), CRI of 85 (minimum), color temperature as indicated and average rated life of 30,000 hours, unless otherwise indicated.

- C. Compact Fluorescent Lamps: CRI 85 (minimum), color temperature as indicated, average rated life of 10,000 hours at 3 hours operation per start, unless otherwise indicated.

2.7 FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gage.
- E. Rod Hangers: 3/16-inch- minimum diameter, cadmium-plated, threaded steel rod.
- F. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- G. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

2.8 FINISHES

- A. Fixtures: Manufacturers' standard, unless otherwise indicated.
 - 1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
 - 2. Metallic Finish: Corrosion resistant.

2.9 LIGHTING CONTROL DEVICES (WHERE INDICATED ON DRAWINGS)

- A. Dimming Ballast Controls: Preset or Sliding-handle type with on/off control; compatible with ballast and having light output and energy input over the full dimming range.
- B. Light Level Sensor: Standalone photosensor and control system to detect changes in ambient lighting level and provide dimming range of 20 to 100 percent in response to change.
 - 1. Sensor Capacity: At least 40 electronic dimming ballasts.
 - 2. Adjustable Ambient Detection Range: 10 to 100 fc minimum.

2.10 SOURCE QUALITY CONTROL

- A. Factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

- B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
 - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners.
 - 2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
 - 4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

- C. Suspended Fixture Support: As follows:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Suspend from cable.

- D. Adjust aimable fixtures to provide required light intensities.

3.2 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.

3.3 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Verify normal operation of each fixture after installation.
- C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.
- E. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

END OF SECTION 265100

DIVISION 27 - COMMUNICATIONS

Section 27 0000	Common General Conditions for Communication Sections
Section 27 0100	Operation Maintenance of Communication Systems
Section 27 0113	Warranty, Product and System
Section 27 0119	Field Testing and Reporting
Section 27 0133	Shop Drawings, Product Data, Samples, Design Records and Existing Conditions
Section 27 0143	Qualifications and Required Training for Contractor and Installer
Section 27 0171	Responsibility and Workmanship of Contractor
Section 27 0186	Performance Requirements and Application Support
Section 27 0500	Common Work Results for Communications
Section 27 0526	Grounding and Bonding for Communication Systems
Section 27 0528	Pathways for Communication Systems
Section 27 0529	Hangers and Supports for Communication Systems
Section 27 0533	Conduits and Back Boxes for Communications Systems
Section 27 0536	Cable Trays for Communication Systems
Section 27 0539	Surface Raceways for Communications System
Section 27 0553	Identification for Low-Voltage Cables and Labeling
Section 27 1100	Equipment Room Fittings
Section 27 1116	Cabinets, Racks, Frames and Enclosures
Section 27 1119	Termination Blocks and Patch Panels
Section 27 1123	Cable Management and Ladder Rack
Section 27 1300	Backbone Cabling
Section 27 1500	Horizontal Cabling
Section 27 1513	Copper Cable
Section 27 1543	Faceplates and Connectors
Section 27 1619	Patch Cables
Section 27 4114	Audio Systems
Section 27 4115	Video Systems
Section 27 4116	Control Systems
Section 27 5119	Sound Masking Systems
Section 27 6001	Appendix 01 Deviation Request Process
Section 27 6002	Appendix 02 Document Refresh Process
Section 27 6004	Appendix 04 Reference Standards
Section 27 6005	Appendix 05 Definitions and Abbreviations
Section 27 6006	Appendix 06 Material Suppliers
Section 27 6007	Appendix 07 Siemon CI's – 270100 Certified Installation Firms, Siemon Approved
Section 27 6009	Appendix 09 Common Cable Fill Scenarios

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SECTION 27 0000

GENERAL COMMON CONDITIONS FOR ALL COMMUNICATIONS SECTIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes general communications design requirements, and administration topics that are applicable to all Division 27 Sections.
- B. This document is based upon the 2012 Construction Specification Institute (CSI) Master Format numerical and title indicators for sections within Division 27: Communications
- C. Where IT or Owner representation is stipulated in this Division, it shall be provided by the Data Center Operations Infrastructure Cabling team, and Intermountain Medical Group as applicable.

1.2 SUBMITTALS

- A. Product data for each type of product installed.
 - 1. Includes data room framework, pathways outside of the data rooms, connectivity and finishes, etc.
 - 2. For all cables, additionally include nominal O.D., weight per 100 foot, minimum bend radius, maximum pulling tension.
 - 3. For pathways, additionally include cable capacity count relating to allowable fill and specified growth factor.
- B. Shop drawings
 - 1. Labeling schedules and layouts in owner designated electronic format
 - 2. Cabling administrative drawings
 - 3. Typical wiring schematics

1.3 CONDITIONS

- A. Specifications, Guidelines, Details, and Tables for all Division 27 sections can be accessed on the manufacturer's web site: <http://siemon.com/us/>
- B. Drawings and General provisions of the contract, including Uniform General Conditions, Supplementary General Conditions, architectural plans and specifications, requirements of Division 1, electrical, mechanical, plumbing, audio visual, security and telecommunications specifications and plans apply to the communications section, and shall be considered a part of this section. The Contractor shall read all sections in their entirety and apply them as appropriate for work in this section.
- C. Conflicts:
 - 1. Drawings and specifications are to be used in conjunction with one another and to supplement one another. In general the specifications determine the nature and quality of the materials and tests, and the drawings establish the quantities, details, and give characteristics of performance that should be adhered to in the installation of the communications system components.

2. If there is an apparent conflict between the drawings and specifications, or between specification sections, the items with the greater quantity or quality shall be estimated and installed.
3. Clarification with the Owner and/or Owner's Representative about these items shall be made prior to the ordering and installation.

D. OWNER / CONTRACTOR

1. The facility will submit appropriate scope of work information that will allow the contractor to appropriately plan and bid the project. Some of the items that should be included are:
 - a. Building size and layout
 - b. Number of work area drop locations
 - c. Telecommunication Rooms, Closet numbers and locations
 - d. Pathway types and location

E. CONTRACTOR

1. Furnish all labor, materials, tools, equipment and services for the installation described herein. Provide add/deduct unit pricing for all components as part of the bid response. Base fixed price add/deduct units on an average cable length of 175 linear feet.
2. The Contractor shall procure, submit for review, and maintain for the duration of this agreement insurance against claims for injuries to persons or damages to property which may arise from, or in connection with, the performance of work hereunder by the Contractor, his agents, representatives, employees or subcontractor. The Contractor shall pay the cost of such insurance.
3. The Contractor and its employees will respect and protect the privacy and confidentiality of the Owner, its employees, clients, patients, processes, products, project information, project documents, and intellectual property to extent necessary, consistent with the legal and policy responsibilities of the Owner. Contractors and their employees shall sign a non-disclosure confidentiality agreement and abide by the requirements to keep confidential all information as outlined above.
4. Use of Subcontractors: Successful bidder shall inform the Owner's contact and/or General Contractor in writing about the intention to use Subcontractors and the scope of work for which they are being hired. The Owner or Owner's designated contact must approve the use of Subcontractors in writing prior to the Subcontractor's hiring and start of any work.
5. The Contractor's designated project manager will be recognized as the single point of contact. The Project manager shall oversee all work performed to ensure compliance with specifications as outlined in bid documents (which includes all specifications and drawings) to ensure a quality installation.

1.4 SCOPE OF WORK :

A. This establishes a communications infrastructure to be used as signal pathways for voice, high-speed data transmission, and other low voltage services. Contractor shall:

1. Comply with all Master Specifications documents and the following requirements for a complete project installation.
2. Provide a structured cabling system as described hereafter that includes, but is not limited to, supplying, installing, labeling and testing of: fiber backbone, fiber and voice riser cable; data copper, fiber, and voice copper horizontal cabling, cable connectors, communications outlets and terminations, patch cables, and equipment racks/cabinets for networking hardware and patch panels.
3. All requirements and specifications will be enforced. Cable pathways and runs to individual outlets are not shown in their entirety, but shall be provided as if shown in their entirety.
4. Coordinate with electrical tradespersons to verify conduit routing does not cause cabling to exceed allowable link length.

5. Follow industry standard installation procedures, including BICSI Installation Standard and guidelines as well as specified manufacturers standard recommended procedures and installation practices for communications cable to assure that the mechanical and electrical transmission characteristics of this cable plant and equipment are maintained.

1.5 REFERENCE standards:

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of the Contract shall be applicable to this Project.
- C. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only.
- D. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean reference to the latest printed edition of each in effect at the date of contract.
- E. Codes and Standards (Most recent editions with addenda/TSB, etc.) All materials, installation and workmanship shall meet or exceed the applicable requirements and standards addressed within the references listed in **Appendix 04**.

1.6 DEFINITIONS:

- A. Definitions and Abbreviations are listed in **Appendix 05**:

PART 2 - PRODUCTS

2.1 PRODUCTS AND WORK not included BY DIVISION 27 (NIC):

- A. Others shall separately purchase and/or provide certain equipment and miscellaneous items that will be installed during the course of the installation process. Such items may not be indicated in the documents. Contractor shall coordinate with the Owner and his suppliers when considering:
 1. Provision and installation of phone systems, computer hardware, and related networking software and equipment.
 2. Provision and installation of multi-port routers, hubs, and UPS in communications rooms.
 3. Communications grounding bus bars and grounding wires connecting to the main building electrode system by Division 26.
 4. Dedicated power panels, ground bus bars, circuits and utility outlets.
 5. Installation and finishing of plywood backboards.
 6. Building mechanical ductwork, cooling/heating system, and environmental control sensors.
 7. Communication pathway devices such as, conduits, conduit sleeves, back boxes, and penetrations in walls and floors. Including, but not limited to concealed work, office spaces and open areas.
 8. Provision and installation of modular furniture and millwork.

2.2 MEASUREMENT PROCEDURES:

- A. The Contractor shall

1. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.
2. Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements and scale on shop drawings.
3. Coordinate fabrication schedule with construction progress to avoid delaying the work.
4. Where field measurements cannot be made without delaying the work, establish dimensions and coordinate with the General Contractor.
5. When approved, proceed with fabricating units without field measurements.

2.3 CHANGES

A. ALTERNATES:

1. If an alternate material is proposed that is equal to or exceeds specified requirements, Contractor shall provide manufacturers' specifications in writing for Owner approval prior to purchase and installation.
2. Substitutions of material by the Contractor shall be in writing complete with written manufacturers' specifications. The material substituted shall not void, alter or change manufacturers' structured cabling system warranty.
3. Contractor shall:
 - a. Provide a complete cabling infrastructure according to these written specifications and drawings. If the Owner changes the scope of work to be performed by the Contractor, it shall be in writing.
 - b. Promptly respond to these changes with a complete material list, including pricing, labor, and taxes in writing presented to the Owner for approval.
 - c. Not proceed with any additional scope of work without a signed approval by the Owner.
4. Owner will not pay for additional work performed by the Contractor without signed approval of these changes. Contractor will submit a copy of signed change order upon billing.
5. The Owner's Infrastructure Cable team will be the final judge of acceptability, with review by Owner's Representative and the distribution of the acceptance by the Architect. No substitute shall be ordered, installed or utilized without the Architect's prior written verification of acceptance from the Owner's Infrastructure Cable team.

B. SUBSTITUTION PROCEDURES

1. Substitution may be considered when a product becomes unavailable through no fault of the Contractor.
2. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Include in each request for substitution:
 - a. Product identification, manufacturer's name and address.
 - b. Product Data: Description, performance and test data, reference standards, finishes and colors.
 - c. Samples: Finishes
 - d. Complete and accurate drawings indicating construction revisions required (if any) to accommodate substitutions.
 - e. Data relating to changes required in construction schedule.
 - f. Cost comparison between specified and proposed substitution.
3. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
4. The Owner will be the final judge of acceptability, with review by Owner's Representative and the distribution of the acceptance by the Architect. No substitute shall be ordered, installed or utilized without the Architect's prior written verification of acceptance from the Owner's Infrastructure Cable team.

PART 3 - EXECUTION

3.1 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Contractor shall supply all city, county, and state telecommunication cabling permits required by appropriate governing agency.
2. Prior to commencing work, the Contractor and staff shall secure all required Intermountain Healthcare permits including, but not limited to; facility sign in, ceiling work permits, hot work permits, and confined space permits.
3. Contractor shall be city, county, and state-licensed and/or bonded as required for communications/low voltage cabling systems work.

B. Infection Control Requirements:

1. Contractor shall comply with Infection Control, Immunization, Orientation, Confidentiality, ID badging, and other policies as outlined in Section 01.
2. Contractor shall have current RepTrax registration where required.

C. Certifications:

1. Contractor shall submit an up-to-date and valid certification verifying qualifications of the Contractor and installers to perform the work specified herein at time of bid submission.
2. Contractor shall have a complete working knowledge of low voltage cabling applications such as, but not limited to data, voice and video network systems.
3. Contracting firm shall have installed similar-sized systems in at least ten (10) other projects in the last five years prior to this bid and be regularly engaged in the business of installation of the types of systems specified in this document. Certification shall include, but not be limited to, items such as name and location of project contacts and numbers, total square footage, total number of cables/drops, types of media, etc.
4. Contractor shall provide certificates for the appropriate insurance coverage as defined in contract documents.
5. All installer personnel that will be assigned to this project shall be listed in a qualification document. 50% of the personnel working on the job site shall have a minimum of 3 years experience in the installation of the types of systems, equipment, and cables specified in this document. Any personnel substitutions shall be noted in writing to Owner's DCO Infrastructure Cabling representative prior to commencement of work.
6. BICSI ITS Cabling Installation Program Installer Level 1 or 2 or Technician certifications may be substituted in lieu of the 3 year requirement. All cabling installers shall be trained and certified by the cable manufacturer for communication cabling installations and maintenance of said materials.
7. Refer also to General Conditions and Section 270143.
8. Contractor shall submit evidence of compliance with these requirements prior to beginning work on the project.
9. Cabling installers shall be trained and certified by the cable manufacturer for communication cabling installations and maintenance of said materials. Refer also to General Conditions and Section 270143.

D. Administrative Requirements and Coordination:

1. The Contractor shall:
 - a. Provide a specified contact person (name and contact number) for coordination to attend project meetings with the communication consultant, the Owner and others.
 - b. Coordinate work of this section with Owner's system specifications, workstations, equipment suppliers, and installers.

- c. Coordinate installation work with other crafts (examples include ceiling grid contractors, HVAC and sheet metal contractors, etc) under the direction of the General Contractor to resolve procedures and installation placement for cable trays and cable bundle pathways. The goal of this coordination will be to establish priority pathways for critical data/voice network cable infrastructure, materials, associated hardware, as well as mitigate delays to the project and to allow service access for communications and HVAC components. Damage by Contractor to the craftwork of others will be remedied at the Contractor's expense in a timely manner.
- d. Exchange information and agree on details of equipment arrangements and installation interfaces. Record agreements reached in meetings and distribute record to other participants, Owner and communication consultant.
- e. Arrangement, layout, and locations of distribution frames, patch panels, and cross-connect blocks in equipment rooms and racks to accommodate and optimize arrangement and space requirements of any service provider equipment, telephone system, and LAN equipment as directed by DCO. Tasks shall be coordinated with the Owner's DCO team, and other trades' installation representatives.
- f. Where installed, confirm exact locations and method of mounting outlets in modular furniture. Follow furniture manufacturers' written instructions for installing cable and devices in modular partitions. Obtain modular furniture and power pole locations from the General Contractor. Wiring locations noted in plans along walls for modular furniture are approximate and will have to be determined by Contractor at time of installation. Field condition adjustments for installation may have to be made and coordination efforts with the electrical contractor for pathway must take place early on in the project to comply with maximum 40% conduit fill factor requirements.
- g. When requested by Owner or Owner's representative, furnish extra materials that match specified products and that are factory packaged with protective covering for storage and identified with labels describing contents.

E. Contract Administration:

- 1. Change orders shall be submitted to the Owner/Project Manager complete with price breakdown and description for approval before any work is done.
- 2. Owner's DCO Representative will provide job field reports upon inspection of Contractor's installation, materials, supporting hardware, coordination with other trades and progress to schedule to the Owner's project manager.
- 3. Job Field Report outline:
 - a. General installation progress in relation to scheduled work made by the Contractor up to that date.
 - b. All deficiencies noted in the cable installation to be corrected by the Contractor.

F. Pre-Installation Meetings - Contractor shall:

- 1. Attend and/or arrange a scheduled pre-installation conference prior to beginning any work of this section.
 - a. Agenda: This venue is to ask and clarify questions in writing related to work to be performed, scheduling, coordination, etc. with consultant and/or project manager/and DCO Infrastructure Cabling representative.
 - b. Attendance: Communications project manager/supervisor shall attend meetings arranged by General Contractor, Owner's DCO Infrastructure Cabling representatives, and other parties affected by work of this document.
 - c. All individuals who will be installers of communication cables and equipment in an on-site supervisory capacity shall be required to attend the pre-installation conference. Individuals who do not attend the conference will not be permitted to supervise the installation of, or install, terminate, or test communications cables on

the project. This includes supervisors, project managers, and lead installers of this project.

- G. Request For Change (RFC)
 - 1. An RFC shall be opened and approved by the CAB prior to any modifications, attachments, or other activities that may affect production systems.
 - a. Policy and details available through the Data Center at Lake Park.
- H. Post-Installation Meetings:
 - 1. At the time of substantial completion, or shortly thereafter, the Contractor shall call and arrange for a post-installation meeting to present and review all submittal documents to include, but not limited to as-built drawings, test reports, warranty documentation, etc. Attendees shall be Owner staff, Owner's Representative, General Contractor, and others that the General Contractor deems appropriate.
 - 2. At this meeting the Contractor shall present and explain all documentation, including test results, and ask for feedback on its completeness. Any discrepancies or deviations noted by and agreed to by participants shall be remedied by Contractor and resubmitted within one week of meeting.

3.2 DELIVERY, STORAGE, AND HANDLING:

- A. Coordination with delivery companies, drivers, site address, and contact person(s) will be the responsibility of the Contractor.
- B. Contractor Shall:
 - 1. Be responsible for prompt material deliveries to meet contracted completion date.
 - 2. Coordinate deliveries and submittals with the General Contractor to ensure a timely installation.
 - 3. No equipment materials shall be delivered to the job site more than three weeks prior to the commencement of its installation.
 - 4. Equipment shall be delivered in original packages with labels intact and identification clearly marked.
 - 5. Equipment shall not be damaged in any way and shall comply with manufacturer's operating specifications.
 - 6. Equipment and components shall be protected from the weather, humidity, temperature variations, dirt, dust, or other contaminants. Equipment damaged prior to system acceptance shall be replaced at no cost to the Owner.
 - 7. Contractor shall be responsible for all handling and control of equipment. Contractor is liable for any material loss due to delivery and storage problems.
- C. Owner/General Contractor shall supply a list of security requirements for Contractor to follow.

3.3 PROJECT/SITE CONDITIONS

- A. For all environmental recommendations, refer to master Architectural section.
- B. For all security recommendations, refer to related Division 01.
- C. After completing system installation, including outlet fittings and devices, inspect exposed finish. Contractor will remove burrs, dirt, and construction debris. If applicable, the Contractor will repair damaged finishes, including chips, scratches, and abrasions.

- D. Contractor shall provide daily a clean work environment, free from trash/rubbish accumulated during and after cabling installation.
- E. Food and drink are not permitted in work areas. They shall be stored, prepared, and consumed only in designated break or cafeteria areas.
- F. Contractor shall keep all liquids (drinks, sodas, etc.) off finished floors, carpets, and tiles. If any liquid or other detriment (cuts, soils, stains, etc.) damages the above finishes, Contractor shall provide professional services to clean or repair scratched/soiled finishes, at Contractor's expense.

3.4 CLEANING

- A. Work areas will be kept in a broom clean condition throughout the duration of the installation process.
- B. Remove all unnecessary tools and equipment, unused materials, packing materials, and debris from each area where work has been performed daily, unless designated for storage.
- C. The Contractor will damp clean all surfaces prior to final acceptance by Owner.

END OF SECTION

SECTION 27 0100

OPERATION/MAINTENANCE OF COMMUNICATION SYSTEMS

PART 1 - GENERAL

1.1 OVERVIEW

A. INTRODUCTION

1. The layer 1 committee working with the communications subcommittee is providing this document as a guideline that has been approved by the enterprise architecture review board (EARB). In order to make the approval of such a large topic possible, the subcommittee broke the structured cable topic into its sub components and each subcomponent was completed, reviewed, and approved in turn. The end result is this comprehensive guideline that should provide adequate guidance on this topic.

PART 2 - PRODUCT

2.1 Key Points

- A. Category 6A shielded foil over unshielded twisted pair (F/UTP) is the only approved standard for cabling.
 1. Specifically Siemon category CAT6A F/UTP (foil over unshielded twisted pair) cable and associated patch panels, wall plates and jacks; for data centers, and all clinical and hospital campus'.
 2. Only Siemon certified contractors or certified Intermountain Healthcare facility staff will install structured cable at Intermountain Healthcare facilities.

2.2 Supporting Information

- A. CAT6A F/UTP provides more head-room over CAT5e. Specifically 500Mhz bandwidth vs 100Mhz bandwidth.
- B. CAT6A F/UTP provides superior cross-talk and external noise immunity, with CAT6A F/UTP providing better immunity to external noise.
- C. CAT6A F/UTP provides additional application of 10gig throughput at 100 meters.
- D. CAT6A F/UTP provides substantial "future proofing" by cost when compared with fiber or the proposed CAT7a shielded cable.
- E. CAT6A F/UTP reduces POE losses due to reduced Voltage drop
- F. CAT6A F/UTP provides improved heat dissipation for POE routes.
- G. CAT6A F/UTP utilizes the RJ-45 footprint, thus making it backward compatible.

2.3 IMPLEMENTATION

- A. This guide is to be used for New Construction and Remodels. These standards will be implemented over time in existing cabling environments as rework is performed.

- B. If there is a current need to connect servers at 10GBaseT and the only option was copper, CAT6A F/UTP is recommended. New Server connections shall be a minimum OM4.
- C. Installations already in place are not required to remove or replace existing cabling CAT5e or newer. All new cabling shall follow the recommendation to use CAT6A F/UTP cabling.

2.4 STANDARD PRODUCT

- A. The Approved cable type for horizontal cabling is dependent on the type, location and port requirements of the Work Area.
 - 1. The Approved Standard Manufacturer for Intermountain's horizontal cabling is:
Siemon Company USA
101 Siemon Company Drive
Watertown, CT 06795
 - 2. Approved Suppliers of Siemon cable, patch panels, jacks, and parts are listed in Appendix 06:

PART 3 - EXECUTION

3.1 Horizontal Cabling

- A. The Horizontal Subsystem is the portion of the communications cabling system that extends from the work area communications outlet/connector to the Floor Distributor (FD)/Horizontal Cross-connect (HC) in the communications room (TDR). It consists of the communications outlet/connector, the horizontal cable, optional consolidation point, and that portion of the cross-connect in the telecommunications room serving the horizontal cable. Each floor of a building should be served by its own Floor Distributor/Horizontal (FD/HC) Subsystem located in the Communications Room. (TDR)
 - 1. NOTE: Cable installers have rigorous requirements to be certified for Siemon cables and products. Validation of certification is required prior to accepting a bid.
 - 2. Current Siemon Approved/Certified Cable Installers for Siemon Network are listed in Appendix 07.
- B. Reliability of the horizontal cabling system is critical to the operation of IS equipment throughout a facility. Installing the cable is extremely labor intensive and there are a number of learned skills used to correctly install the cable. Cable installers are certified and installers must demonstrate the ability to install the cable correctly to be certified. If the cable is installed by a certified installer and is installed in accordance with the manufactures guidelines, the manufacturer will warranty the cable installation.
- C. The manufacturer also requires the cables to be individually labeled and 100% tested and certified. Cable testing and certification equipment is usually expensive and is not commonly available at the facility or many telecom installers. Certified Installer companies are required by the manufacturer to be knowledgeable in the use of "Qualified" Field Testing equipment and provide test results for warranty registration. Contractor is to verify with the manufacturer the current "Qualified" tester manufacturers and the current operating software. Contractors will provide test results in the operating software format (not PDF, text or Word) to Intermountain Healthcare upon completion.
- D. Much of the cable is installed in walls and in the ceiling and usually lasts the lifespan of the building. As with most technology, the lifespan of cable is actually its usability and applicability to its use on future computing technology.

END OF SECTION

SECTION 27 0113

WARRANTY, PRODUCT AND SYSTEM

PART 1 - GENERAL

1.1 NOT USED

PART 2 - PRODUCTS

2.1 STANDARD WARRANTY

- A. Siemon Pre-registration form must be filled out and sent to Siemon before work is to begin. Intermountain Healthcare must also have The Pre-registration Letter from The Siemon Company before work is to begin.
- B. Upon Completion of the project, the Siemon Registration form along with all test results, copper and fiber must be submitted to the Siemon Company for approval. After approval by the Siemon Company, Intermountain Healthcare must receive the Full Warranty Documentation from The Siemon Company before final retention funds are released to the General Contractor, Electrical Contractor and the Certified Installer Subcontractor.
- C. Contractor shall provide a minimum one (1) year warranty on installation and workmanship PLUS an Extended Product Warranty and System Assurance Warranty for this wiring system and shall commit to make available local support for the product and system during the Warranty period.
- D. System Certification: Upon successful completion of the installation and subsequent inspection, the customer shall be provided with a numbered certificate, from the manufacturer, registering the installation.
- E. Either a permanent link or channel model configuration may be applied to the horizontal and/or backbone sub-systems of the structured cabling system. Applications assurance is only applied to a channel model configuration. All channels are to be qualified for linear transmission performance up to 500 MHz to ensure that high-frequency voltage phase and magnitude contributions do not prove cumulative or adversely affect channel performance.

2.2 EXTENDED WARRANTY

- A. The manufacturer of passive telecommunications equipment used in a manner not associated with the Systems Warranty must have a minimum five (5) year Component Warranty on all its product. The Products Warranty covers the components against defects in material or workmanship under normal and proper use.
 - 1. Special Project Warranty: A full end-to-end written warranty mutually executed by manufacturer and the principal Installer, agreeing to replace and install voice/data distribution system components that fail in materials or workmanship, or do not meet manufacturer's official published specifications and performance criteria within the special Project warranty period specified below. This shall cover applications assurance, cable, and connecting hardware including both labor and materials. This warranty shall be in addition to, and not a limitation of, other rights and remedies the Owner may have against the Contractor under the Contract Documents

- B. A twenty (20) year warranty available for the Category 6A Z-MAX copper structured cabling system shall be provided for an end-to-end channel model installation which covers applications assurance, cable, connecting hardware and the labor cost for the repair or replacement thereof. If a fiber warranty is requested/required it will be an XGLO twenty (20) year warranty, which is based on using 50/125µm, laser optimized multi-mode fiber as minimum.
 - 1. Performance claims based on worst case testing and channel configurations
 - 2. Special Project Warranty Period: 20 years minimum, beginning on the date of Substantial Completion.
 - 3. Siemon Certified Warranty Requirements:
 - a. The Siemon Pre-Registration form must be filled out and sent to Siemon before work is to begin. Intermountain Healthcare must also have the Pre-Registration Letter from The Siemon Company before work is to begin.
 - b. Upon Completion of the project, Intermountain Healthcare must receive the Full Warranty Documentation from The Siemon Company before final retention funds are released to the general contractor, electrical contractor and structured cabling subcontractor if applicable

2.3 MAINTENANCE

- A. Support Availability: The Contractor shall commit to make available local support for the product and system during the Warranty or Extended Warranty period.
- B. Many Intermountain Healthcare facilities operate 24/7/365.

END OF SECTION

SECTION 27 0119

FIELD TESTING AND REPORTING

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION:

- A. Owner reserves the right to be present during any or all testing.
- B. The objective of this project is to provide a complete communications cabling infrastructure system installation including, but not limited to: fiber backbone, riser system, horizontal data and voice cabling with associated terminations, mounting equipment, cable pathway and management systems, testing and other items/materials, as specified in drawings, these specifications, and contract documents.
- C. The Contractor's BICSI Registered Communications Distribution Designer (RCDD) supervisor shall review, approve and stamp all documents prior to submitting. The Contractor's RCDD shall warrant in writing that 100% of the installation meets the requirements specified herein upon completion of all work.
- D. Product Certificates shall be signed by manufacturers of cables, connectors, and terminal equipment certifying that products furnished comply with requirements.
- E. Contractor shall submit the required Field Test Reports in the format and media specified, upon completion of testing the installed system.
- F. Contractor shall deliver manufacturer's signed long-term Warranty of installed cabling system to include all components that comprise the complete cabling system. Delivery to be effected within two weeks of the time of final punch list review. Failure of any component to pass system component tests shall be promptly corrected, repaired or replaced to meet standards compliance. Contractor shall coordinate with manufacturer for warranty paperwork and procedures prior to the start of the project.

1.2 PREFERRED OWNER INSPECTION & TEST CHECKPOINTS

- A. DCO & ICT Inspection Milestones & Responsibilities need to be coordinated into master project plan to allow the GC to make timely arrangements. All are per floor and/or phase.
 - 1. ICT & DCO = Framing, during and/or after boxes & conduits are in place; prior to sheetrock.
 - 2. ICT = When cable basket is starting to be installed
 - 3. ICT = When cable basket is ready, but prior to starting to pull cable
 - 4. ICT & DCO = When TDR's are ready for racks and ladders
 - 5. When TDR environmental requirements are ready, room is dust free, and securable.
 - 6. TDR's should be high on the build list to allow sufficient time to complete
 - 7. DCO = When anchoring racks and laying out equipment
 - 8. ICT = When trim and testing are in progress
 - 9. For mechanical systems punch list walks.
 - 10. OTHERS
 - a. Depending on project, the manufacturer will inspect 1 or 2 times.
 - b. DCO or ICT = When problems or questions arise.

PART 2 - PRODUCTS

2.1 Site Tests & Inspections:

- A. Prior to pulling cable, the cabling contractor shall schedule an inspection of the pathways with a member of the Data Center Operations Infrastructure cabling team.
- B. Upon completion of the communications infrastructure systems, including all pathways and grounding, the Contractor shall test the system.
 - 1. Cables and termination modules shall be affixed, mounted or installed to the designed/specified permanent location prior to testing.
 - 2. Any removal and reinstallation of any component in a circuit, including faceplates, shall require retesting of that circuit and any other disturbed or affected circuits.
 - 3. Cable/jack shall be affixed, mounted or installed to the designed/specified permanent location prior to testing. Any removal and reinstallation of any component in the circuit shall require retesting of that circuit.
 - 4. Approved instruments, apparatus, services, and qualified personnel shall be utilized.
 - 5. If tests fail, Contractor shall correct as required to produce a legitimate passing test.
 - 6. Manipulation of tester parameters on a failing test in order to achieve a passing test is unacceptable.
- C. These specifications will be strictly enforced. The Contractor must verify that the requirements of the specifications are fully met through testing with an approved tester (rated for testing the cable type in use), and documentation as specified below. This includes confirmation of requirements by demonstration, testing and inspection. Demonstration shall be provided at final walk-through in soft copy and printed test data.
- D. Notification of the likelihood of a cable exceeding standardized lengths must be made prior to installation of the cable. Without contractor's prior written notice and written approval by the Owner, testing that shows some or all pairs of cable not meeting specifications, shall be replaced at Contractor's expense (including respective connectors).
- E. With the Owner's written approval, the over-length cable(s) shall be excluded from requirements to pass standardized tests and shall be explicitly identified.
- F. Testing is still required for non-compliant cabling. The tests shall be for wire-mapping, opens, cable-pair shorts, and shorts-to-ground. The test results must be within acceptable tolerances and shall be submitted with the Owner's acceptance document.

2.2 Cable Testing Plan:

- A. The Contractor shall:
 - 1. Provide a complete and detailed test plan for approval of the cabling system specified herein, including a complete list of test equipment for copper and fiber optic components and accessories prior to beginning cable testing. The following minimal items shall be submitted for review:
 - a. All testing methods that clearly describes procedures and methods.
 - b. Product data for test equipment
 - c. Certifications and qualifications of all persons conducting the testing.
 - d. Calibration certificates indicating that equipment calibration meets National Institute of Standards and Technology (NIST) standards and has been calibrated at least once in the previous year of the testing date.
 - e. Examples of test reports, including all graphs, tables, and charts necessary for display of testing results.

2. Include validation, and testing. Owner will require that the telecommunications cabling system installed by the Contractor be fully certified to meet all necessary requirements to be compliant with referenced IEEE and TIA specifications and vendor's warranty.
3. Will determine the source/cause of test failure readings and correct malfunctioning component and/or workmanship within each channel or permanent link and retest to demonstrate compliance until corrected failure produces a passing result.

2.3 Cable Testing Reports:

- A. The Contractor shall submit cable test reports as follows:
 1. Submit certified test reports of Contractor-performed tests.
 - a. The tests shall clearly demonstrate that the media and its components fully comply with the requirements specified herein.
 - b. Three (3) set(s) of electronic and hardcopy versions of test reports shall be submitted together and clearly identified with cable identification.
 - c. Cable inventory data shall be submitted for all fiber, copper, and coaxial cabling and termination equipment. Submit data electronically on CD-ROM or Flash Drive, listing products furnished, including:
 - 1) Manufacturer's name.
 - 2) Manufacturer's part numbers.
 - 3) Cable numbers.
 - 4) Location and riser assignments.
 - 5) Product Data:
 2. Equipment and materials shall be standard products of a manufacturer regularly engaged in the manufacture of telecommunications cabling.

PART 3 - EXECUTION

3.1 TEST EQUIPMENT

- A. All transmission testing of balanced twisted-pair cables shall be performed with an approved Level IIIe balance twisted pair tester found on the Siemon Ally Website. The latest version of software shall be installed prior to performing testing. Refer to the Siemon Warranty Documents for proper testing requirements of associated cable and components.
- B. All balanced twisted-pair field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided for review prior to the start of testing
- C. Autotest settings provided in the field tester for testing the installed cabling shall be set to the default parameters
- D. Test settings selected from options provided in the field testers shall be compatible with the installed cable under test.

3.2 TEST METHOD / CRITERIA

- A. Copper Testing
 1. Testing of all newly installed cable channels shall be performed prior to system cutover.
 - a. Visually inspect F/UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-C.1.

- b. Visually confirm Category 6A marking of outlets, cover plates, outlet/connectors, and patch panels.
 - c. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - d. Test F/UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - e. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-C, and those required by manufacturer to validate and start warranty.
2. Copper Testing All 500 MHz category 6A field-testing shall be performed with an approved level 111e balanced twisted-pair field test device, that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex (Level IIe or III balanced twisted pair field test device). Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration..
 3. All installed 500 MHz category 6A channels shall perform equal to or better than the minimum requirements as specified below:
 - a. Category 3, balanced twisted-pair backbone cables, whose length does not exceed 90 m (295 ft) for the permanent link, and 100 m (328 ft) for the channel shall be 100 percent tested according to ANSI/TIA/EIA-568-C.1. Test parameters include wire map plus F/UTP (ScTP) shield continuity (when present), insertion loss, length and NEXT loss (pair-to-pair). NEXT testing shall be done in both directions.
 - b. All balanced twisted-pair backbone cables exceeding 90 m (295 ft) or 100 m (328 ft) shall be 100% tested for continuity if applications assurance is not required.
 - c. 500 MHZ CATEGORY 6A BALANCED TWISTED-PAIR HORIZONTAL AND BACKBONE CABLES, WHOSE LENGTH DOES NOT EXCEED 90 M (295 FT) FOR THE PERMANENT LINK, AND 100 M (328 FT) FOR THE CHANNEL SHALL BE 100 PERCENT TESTED.
 4. F/UTP Performance Tests
 - a. Wire map.
 - b. Length (physical vs. electrical, and length requirements).
 - c. Insertion loss.
 - d. Near-end crosstalk (NEXT) loss.
 - e. Power sum near-end crosstalk (PSNEXT) loss.
 - f. Equal-level far-end crosstalk (ELFEXT).
 - g. Power sum equal-level far-end crosstalk (PSELFEXT).
 - h. Return loss.
 - i. Propagation delay.
 - j. Delay skew.
 - k. F/UTP Shield continuity.
 5. Final Verification Tests: Perform verification tests for F/UTP systems after the complete communications cabling and workstation outlet/connectors are installed.
 6. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
 7. End-to-end cabling will be considered defective if it does not pass tests and inspections.
 8. Prepare and submit test and inspection reports.

B. Horizontal Fiber Testing

1. Fiber horizontal cables shall be 100% tested for insertion loss and length.
2. Insertion loss shall be tested at 850 nm or 1300 nm for 50/125µm and 62.5/125µm multimode cabling in at least one direction using the Method B (1-jumper) test procedure as specified in ANSI/TIA/EIA-526-14A.
3. Length shall be tested using an OTDR, optical length test measurement device or sequential cable measurement markings.

4. The horizontal link performance guarantees are based on an optical fiber calculation for the appropriate fiber solution. Optical fiber calculations shall be determined using the Siemon Fiber Loss Calculator found on the Siemon Ally Website.

C. Backbone Fiber Testing

1. Fiber backbone cables shall be 100% tested for insertion loss and length.
2. Insertion loss shall be tested at both 850 nm and 1300 nm for 50/125 μ m and 62.5/125 μ m multimode cabling and both 1310 nm and 1550 nm for 8.5/125 μ m singlemode cabling and in at least one direction using the Method B (1-jumper) test procedure as specified in ANSI/TIA/EIA-526-14A.
3. Insertion loss shall be tested at 1310 and 1550 for single-mode cabling in at least one direction using the Method A.1 (1-jumper) test procedure as specified in ANSI/TIA/EIA-526-7.
4. Length shall be tested using an OTDR, optical length test measurement device or sequential cable measurement markings.
5. The backbone link performance guarantees are based on an optical fiber calculation for the appropriate fiber solution. Optical fiber calculations for any fiber cable greater than 90m (295 ft.) shall be determined using the Siemon Fiber Loss Calculator found on the Siemon Ally Website.

3.3 DEMONSTRATION

- A. Include training for appropriate IT staff in numbering system and documentation system methods and record keeping.

END OF SECTION

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SECTION 27 0133

SHOP DRAWINGS, PRODUCT DATA, SAMPLES, DESIGN RECORDS, & EXISTING CONDITIONS

PART 1 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

1.1 SUBMITTALS:

A. The Contractor:

1. Shall not perform any portion of the work requiring submittal and review of shop drawings, product data, or samples until Owner has approved the respective submittal. Such work shall be in accordance with approved submittals.
 - a. Shop drawings as required by the owner or as a minimum to include a minimum of two sets of a plan view and elevations of all work to be installed. The Contractor shall make any corrections required by the owner or the owner's representative or consultant team, file with him two corrected copies and furnish such other copies as may be needed. The consultant's approval of such drawings or schedules shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless he has in writing called the Architect's attention to such deviations at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings or schedules.
2. Shall not perform any portion of the work requiring approval of the System Assurance Warranty manufacturer's warranty registration qualification procedures that would disqualify any part or all of the wiring system from that warranty qualification.

B. The Contractor shall provide a copy of the Certified Test Data Sheet, available from the delivering distribution warehouse for either a full run or cut piece from the Master Reel of the fiber cable to be installed

1. The Certified Test Data Sheet shall include the Master Reel number, cable description, a passing test result with details, test equipment description, date certified, and a certificate of compliance stamp, and shall be included in the O&M Manual as a component of the final deliverables submittal package.

A. The Contractor shall provide the appropriate documentation from the certifying manufacturer showing the project is registered and qualified for the System Assurance Warranty. All subsequent work shall be in accordance with approved submittals.

1.2 DRAWINGS

B. Shop Drawings:

1. The Contractor shall:
 - a. Submit catalogue cut-sheets that include manufacturer, trade name, and complete model number for each product specified. Model number shall be handwritten, marked with an arrow or underlined to indicate exact selection.
 - b. Identify applicable specification section reference for each product performance for each component specified for approval prior to purchase and installation.
 - c. Submit for approval diagrams showing room layouts, rack layouts (including elevations), riser layouts, etc.

B. Record Drawings

1. Drawings for the cabling system infrastructure elements shall be maintained and kept on file by the Siemon Certified Installer (Company) for the entire term of the warranty. Drawings shall include:

- a. Horizontal cable routing and terminations
- b. Telecommunications outlets/connectors
- c. Backbone cable routing and terminations
- d. Telecommunication Spaces (TS)

C. Samples:

1. For workstation outlet connectors, jack assemblies, housings and faceplates for color selection and evaluation of technical specifications and requirements. Confirm with Architect, interior designer, and Owner representative for color before purchasing materials. Face plates shall match electrical face plates in color and material type.
2. Upon request, provide samples for workstation outlets, jacks, jack assemblies, in specified finish, one for each size and outlet configuration
3. Sample mock-up rooms may be required in some areas to ensure proper equipment placement and fit.

D. Qualifications:

1. The Contractor shall provide the appropriate documentation to comply with the requirements set forth in Section 014323 Qualifications, included with, and at the time of, bid submittal.

PART 2 - SUSTAINABLE DESIGN RECORDS AND REPORTS

2.1 DRAWINGS

A. Closeout Submittals (As-built Drawings):

1. Communications Design drawings are to be supplied to the Architect to prepare the master "As-Built" drawings.
2. As-Built drawings shall be in AutoCAD format, same version as used by Architect and consultant. Dimensions and scale of the drawing sheets submitted shall match the size of the drawing used for the contract documents, and shall include the cable numbers labeled in accordance with this document.
3. Utilize normal recognized drafting procedures that match AutoCAD standards, Architect and consultant guidelines and methodology.
4. The As-Built drawings shall incorporate all changes made to the building identified in, but not limited to, addendum, change notices, site instructions or deviations resulting from site conditions.

B. Contractor shall:

1. Clearly identify any resubmitted drawing sheets, documents or cut sheets either by using a color to highlight or cloud around resubmitted information.
2. Maintain drawing numbering or page/sheet scheme consistency as per previously issued drawings/documents.
3. Provide dimensioned plan and elevation views of networking components, showing:
4. All communications data/voice outlet locations complete with outlet/cable labeling.
5. Cable routing paths of communications cables to identified infrastructure pathways.
6. All rack and cabinet locations and labeling thereof.
7. One-line diagram of equipment/device interconnecting data/voice cabling of the data and voice systems.
8. Standard or typical installation details of installations unique to Owner's requirements.
9. Graphic symbols and component identification on detail drawing shall conform to the latest ANSI/TIA 568-C, ANSI/TIA 569-B, ANSI/TIA 606-A and ANSI/NECA/BICSI 607-A conventions.
10. Submit one soft (compatible with Microsoft software) and hard copy with project deliverables within three weeks subsequent to substantial completion.

11. Hard copy of floor plans for record shall be plotted to a standard, saleable, identified drawing scale.

2.2 RECORDS AND REPORTS

- A. All records shall be created by the installation contractor and turned over at the completion of work.
 1. The format shall be computer based
 - a. Soft copies and hard copies shall be part of the As-built package.
 - 1) Soft copies shall be in a Fluke LinkWare compatible database format
 - b. The minimum requirements include:
 - 1) Cable records must contain the identifier, cable type, termination positions at both ends, splice information as well as any damaged pairs/conductors.
 - 2) Connecting hardware and connecting hardware position records must contain the identifier, type, damaged position numbers, and references to the cable identifier attached to it.
 2. Test documentation on all cable types shall be included as part of the As-built package.
 - a. Soft copies and hard copies shall be part of the As-built package.
- B. All Siemon Pre-Warranty and Warranty Registration documents shall be included.
- C. All reports shall be generated from the computer-based program used to create the records above. These reports should include but not limited to:
 1. Cable Reports
 2. Cross-connect Reports
 3. Connecting Hardware Reports

PART 3 - EXISTING CONDITIONS SITE SURVEY

3.1 SITE SURVEY

- A. Prior to placing any cable pathways or cable, the contractor shall survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables. The arrangements to remove any obstructions with the Project Manager need to be determined at that time.

END OF SECTION

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SECTION 27 0143

QUALIFICATIONS AND REQUIRED TRAINING FOR CONTRACTOR AND INSTALLER

PART 1 - GENERAL INSTALLER QUALIFICATIONS

1.1 ENTITIES

A. Communications contractors

1. The Communications Contractor shall at a minimum possess the following qualifications:
 - a. Contractor shall be a Siemon Certified Contractor with valid up to date contract certification and in good standing with the Siemon Company.
 - b. Siemon Certified Contractor and associated Siemon Certified Designer/Installer must have a physical office within the state that any proposed contract work is to be completed.
 - c. Be in business a minimum of five (5) years.
 - d. Contractor shall demonstrate satisfaction of sound financial condition and can be adequately bonded and insured if the project deems necessary.
 - e. Possess those licenses/permits required to perform telecommunications installations in the specified jurisdiction.
 - f. Use personnel knowledgeable in local, state, province and national codes and regulations. All work shall comply with the latest revision of the codes or regulations. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall be followed.
2. Contractor must possess current liability and workers compensation insurance certificates.
3. Contractor must be registered with BICSI and have at least one RCDD on staff.
 - a. or ITS Cabling Installer Program Technician certification and Installer Level 1 & 2 for a minimum of 75 percent of staff
4. Must have personnel fluent in the use of Computer Aided Design and possess and operate CAD software using .DWG or .DXF format.

B. Installers

1. For small projects, (rework, moves, adds, or changes in existing areas), facility staff can be trained and certified for Siemon cable installation. Certification insures continuity and consistency in installation methodology and does not invalidate the Siemon warranty.

C. Demolition

1. Demolition of low voltage cabling shall be performed by the Low Voltage installation contractor.
 - a. To prevent accidental removal of in-use circuits
 - b. To allow for re-use of circuits where practical.

1.2 TRAINING

A. The Contractor shall be fully conversant and capable in the cabling of low voltage applications such as, but not limited to data, voice and imaging network systems. The Contractor shall at a minimum possess the following qualifications:

1. Personnel trained and certified in the design of the Siemon Cabling System®.
2. Personnel trained and certified to install the Siemon Cabling System®.
3. The Designer and Installer shall show proof of current certification of the Siemon Cabling System® via an updated certificate given after attending the CI-301 training course or an on-line re-certification class given every two years.

4. Provide references of the type of installation provide in this specification.
5. Personnel trained and certified in the installation of copper cable and in the use of Level IIIe Copper Transmission Performance testers, fiber optic cabling, splicing, termination and testing techniques. Personnel must have experience using an optical light source and power meter plus an OTDR.
6. Personnel trained in the installation of pathways and supports for housing horizontal and backbone cabling.

END OF SECTION

SECTION 270171

RESPONSIBILITY AND WORKMANSHIP OF CONTRACTOR

PART 1 - GENERAL

1.1 CONTRACTOR RESPONSIBILITY

- A. Contractor shall be obligated to exercise the highest standard of care in performing its obligations as defined in a request for proposal. All work shall be done in a workman like fashion of the highest standards in the telecommunications industry.
- B. All equipment and materials are to be installed in a neat and secure manner, while cables are to be properly dressed in accordance with standards recommendation for a specific type of media (i.e. UTP vs. F/UTP @ 10 Gigabit)
- C. Workers must clean any debris and trash at the close of each job and workday.
- D. Contractor acknowledges that Intermountain Healthcare will rely on contractor's expertise, ability and knowledge of the system being proposed and shall be obligated to exercise the highest standard of care in performing contractual obligation as defined in the Scope of Work.
- E. The successful Certified Installer must submit The Siemon Pre-registration form before any work is to be started.
- F. Contractor must submit The Siemon Registration form, Cable Records, As Built Drawings and Test Results at the completion of work. Note: Intermountain Healthcare reserves the right to withhold final payments until all registration documents are approved by the Siemon Company and received by Intermountain Healthcare.

1.2 CONTRACTOR AND EMPLOYEE RESPONSIBILITY

- A. Contractors, their employees, and installers will attend annually Intermountain Healthcare required Infection Control training.
- B. Contractors, their employees, and installers will attend Intermountain Healthcare required site and job specific orientation.
- C. Contractors, their employees, and installers will maintain Intermountain Healthcare required immunizations.
- D. Contractors, their employees, and installers will keep their Intermountain Healthcare required confidentiality agreements current.
- E. Contractors, their employees, and installers agree to follow all of Intermountain Healthcare Policies and procedures, and wear the appropriate ID at all times while on any of Intermountain properties.
- F. Contractor will determine with Owner the appropriate level of Environmental Containment precautions to utilize for each work location. Infection Control Risk Assessments and permits will be performed as required.

- G. Upon request, provide qualification data for all qualified layout technicians, installation supervisors, and field inspector
 - 1. Siemon issued qualification badges shall be readily available for this purpose.

1.3 EXAMINATION:

- A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.
- B. Established Dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

1.4 PREPARATION:

- A. Contractor's on-site RCDD supervisor shall review, approve and stamp all shop drawings, coordination drawings As Built Drawings and submittal documents.
- B. Pre-installation inspection
 - 1. The Contractor shall visually inspect all cables, cable reels, and shipping cartons to detect possible cable damage incurred during shipping and transport. Visibly damaged goods are not acceptable and shall be replaced by the contractor at no additional cost to the Owner.

1.5 MISCELLANEOUS CONTRACTOR RESPONSIBILITIES

- A. Contractor will maintain unobstructed egress in work areas.
- B. Contractor will keep an access for all Emergency Services.
- C. Contractor will maintain training for Personnel in alternate exits if needed.
- D. Contractor will maintain Temporary construction partitions, as required, that are smoke tight and built of
- E. Non-combustible materials.
- F. Additional Fire Extinguishers may be required, and will be properly maintained and inspected.
- G. Construction site will be maintained clean and orderly.
- H. Contractor will observe Intermountain Healthcare's Tobacco use Policy. (Tobacco use is strictly prohibited)
- I. All Electrical Extension cords will be grounded, and in good condition and, plugged into approved GFI Receptacles.
- J. Construction site will be restricted. (Approved personnel Only)

- K. Required Personal Protective Equipment (PPE) will be worn at as required. (ie: Hard Hats and Safety Glasses)
- L. Tools will be unplugged and power secured at the end of each working day.
- M. All employees and contractors will understand how to obtain MSDS sheets.
- N. Contractor will notify proper personnel of any fire system shut down. A 48 hour notification is required.
- O. Contractor will address all vibration concerns with Intermountain Healthcare staff.
- P. Contractor will address all Noise Issues with Intermountain Healthcare Staff.
- Q. Contractor will fill out a Hot Work permit and keep it on site daily as needed.
- R. Contractor will fill out an Above Ceiling Work Permit and keep it on site daily as needed.
- S. Contractor will obtain a Confined Space Permit, when required, and keep it on site.

END OF SECTION

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SECTION 27 0186

PERFORMANCE REQUIREMENTS & APPLICATIONS SUPPORTED

PART 1 - GENERAL PERFORMANCE REQUIREMENTS

1.1 ACCEPTANCE

- A. Once all work has been completed, test documentation has been submitted, and Owner is satisfied that all work is in accordance with contract documents, the Owner shall notify Contractor in writing of formal acceptance of the system.
 - 1. Horizontal cabling system shall comply with transmission standards in ANSI/TIA/EIA-568-C, when tested according to test procedures of this standard.
- B. Contractor must warrant in writing that 100% of the installation meets the requirements specified herein (Standards Compliance & Test Requirements).
- C. Acceptance shall be subject to completion of all work, successful post-installation testing which yields 100% PASS rating, and receipt of full documentation soft and hard copies as describe herein.
 - 1. PASS* ratings are not considered a PASS rating

PART 2 - GENERAL APPLICATIONS SUPPORTED

2.1 APPLICATIONS SUPPORTED

- A. Existing and future applications supported for a channel model warranty include those approved by the Institute of Electronic and Electrical Engineers (IEEE), the Asynchronous Transfer Mode (ATM) Forum, the American National Standards Institute (ANSI) or the International Organization of Standards (ISO) that specify compatibility with the cable referenced herein.

END OF SECTION

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SECTION 27 0500

COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 NOT USED

PART 2 - PRODUCT

2.1 SUMMARY

- A. This section covers general work results for all Communications Division detail subsections.
- B. Work of the following sections cover a complete installation of both permanent and channel links for a data and voice communications network utilizing copper and fiber transmission media.

PART 3 - EXECUTION

3.1 SCOPE OF WORK

- A. Includes, but is not limited to the following.
 - 1. The Contractor shall:
 - a. Provide and install fabric and/or either plenum, PE or PVC Innerduct, rated appropriately for the installation environment; in accordance with all applicable codes and ordinances.
 - b. Provide, install, terminate, test, label and document all fiber backbone, fiber and copper riser cable.
 - c. Provide, install, terminate, test, and document all fiber, copper voice, and data horizontal cable.
 - d. CAT6A UTP and CAT6A F/UTP shall not be mixed on the same campus.
 - e. Provide and place all termination devices such as, but not limited to, modular patch panels, termination blocks, information outlets (jacks and plates), phone jacks, fiber distribution panels, bulkheads, connectors, and fiber fan out kits.
 - f. Provide in quantities specified interconnect components such as, but not limited to, copper patch cords, fiber patch cables and data station cables.
 - g. Provide and place horizontal and vertical cable support devices such as, but not limited to, rack and wall-mounted horizontal and vertical cable management, cable runway, communications cable runway, and all required mounting hardware, unless otherwise noted.
 - h. Provide and install all equipment mounting racks, cabinets and/or brackets.
 - i. Provide and install UL-approved fire stopping systems in all communication pass-thru, conduits and cable trays, and ceiling, wall and floor penetrations in coordination with General Contractor.
 - j. Provide all appropriate consumable items required to complete the installation.
 - k. Grounding and bonding in MC and TR rooms to grounding bus provided by Division 26.
 - l. Provide complete documentation and demonstration of work.
 - m. Completion of all punch list deficiencies within 10 working days.
 - n. Provide indexed and organized complete Test Results of all copper and fiber cable and their components.
 - o. Provide Submittals as outlined below.

- p. Conduct a final document handover meeting with client, consultant, and PM to review, discuss and educate the Owner on the test results and As-Built Drawings.
- q. Provide a Manufacturer's Extended Product Warranty and System Assurance Warranty for this wiring system.

END OF SECTION

SECTION 27 0526

GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. This work shall be provided by Division 26
 - 1. Division 26 shall provide and install the communications system grounding bus bar,
 - 2. Systems other than the voice/data system shall be bonded by their respective installers or Division 26.
 - 3. Exception: Division 27 shall bond racks, ladders, and other conductive IT equipment and enclosures as required.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- C. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them, including but not limited to the listing found in Section 270000.
- D. Requirements of the following Division 26 Sections apply to this section:
 - 1. Basic Electrical Requirements
 - 2. Basic Electrical Materials and Methods
 - 3. Grounding and Bonding for Electrical Systems

1.2 SUMMARY

- A. This Section includes methods and materials for grounding and bonding Communications systems
- B. All grounding / earthing and bonding shall be done to applicable codes and regulations. It is recommended that the requirements of IEC/TR3 61000-5-2 - Ed. 1.0, ANSI-J-STD-607-A, or both be observed throughout the entire cabling system.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: 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. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.

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.

PART 3 - EXECUTION

3.1 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 (NEC), 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.

3.2 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. Conductor Terminations and Connections:
 - 1. Connections to Structural Steel: Bolted connectors.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with the following items in addition to those required by NFPA 70 (NEC).
 - 1. 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.
 - 2. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.4 INSTALLATION

- A. Grounding Conductors
 - 1. Route along shortest and straightest paths possible, unless otherwise indicated or required by Code.
 - 2. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
 - a. Jumper across all tray junctions Use two hole lugs to prevent loosening of ground connections over time.
 - b. Per BICSI TDMM Chapter 17 "Grounding, Bonding and Electrical Protection":
 - 1) Grounding and bonding connectors should be one of the following: Tin plated copper, copper or copper alloy
 - 2) Connections should be made using bolt or crimp connectors, clamps or lugs OR exothermic welding. Where possible compression type connectors and two-hole lugs should be used

- c. Per TIA/EIA 607-A the TBB (Telecommunications Bonding Backbone) connections "shall be made using irreversible compression-type connectors, exothermic welding or equivalent."

END OF SECTION

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SECTION 27 0528

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Contractor shall install work following specifications, drawings, manufacturer's instructions and approved submittal data.

PART 2 - PRODUCTS

2.1 CABLE PATHWAYS

- A. Comply with TIA/EIA-569-B.
- B. Pathways shall be designed and installed to meet applicable local and national building and electrical codes or regulations.
 - 1. All materials shall be UL- and/or ETL-approved and labeled in accordance with NEC for all products where labeling service normally applies.
 - 2. NRTL labeled for support of Category 6A cabling, designed to prevent degradation of cable performance and pinch points that could damage cable
 - 3. Materials and equipment requiring UL 94, 149 or 1863 listing shall be so labeled. Modification of products that nullifies UL labels is not permitted.
 - 4. The installed systems shall not generate nor be susceptible to any harmful electromagnetic emission, radiation, or induction that degrades, or obstructs any equipment.
- C. Pathways consist of conduit, cable tray/basket tray/ladder rack, J-hooks and surface mounted raceway and power poles.
 - 1. Cable / basket tray shall be utilized for distribution pathways
 - a. Provides proper support and load distribution along pathways.
 - b. Flexibility, scalability, and accessibility
 - c. Ladder rack shall be used in data rooms.
 - 2. Conduits may be utilized where cable tray is not viable.
 - 3. J-hooks are the minimum pathway device required for all low voltage contractors for use in ceiling distribution. J-hooks shall not be spaced further than 5 ft. (1.5 m) apart with a recommendation of 3 ft. (1 m) spacing. Note: Construction may require distances to exceed the maximum and are considered an exception requiring approval of project manager or building engineer. As a minimum, J-hooks must be installed without exception; free flight of cables in ceiling space is not acceptable.
 - a. Ensure all J-hooks and support products meet plenum requirements where applicable.
 - a. J-hooks shall not be utilized for main pathways.
 - 1) A main pathway is where the contained cable bundle will have more than one additional branch
 - 4. Note: Surface mounted raceway and power poles should be installed only when other pathway choices are not feasible.

2.2 EQUIPMENT

A. Compatibility

1. All material and equipment as provided should be the standard Commercial-Off-The-Shelf (COTS) products of a manufacturer engaged in the manufacturing of such products. All shall be typical commercial designs that comply with the requirements specified. All material and equipment shall be readily available through manufacturers and/or distributors.
 - a. All equipment shall be standard catalogued items of the manufacturer and shall be supplied complete with any optional items required for proper installation.
 - b. Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance and backward compatibility
2. Expansion Capability: Unless otherwise indicated, provide spare positions in patch panels, cross connects, and terminal strips, and space in cable pathways and backboard layouts to accommodate 20% future increase in campus distribution and active workstations.
3. Backward Compatibility: The provided solution shall be backward compatible with lower category ratings such that if higher category components are used with lower category components, the basic link and channel measures shall meet or exceed the lower channel's specified parameters.
4. Component Compliance: The provided solution's components shall each meet the minimum transmission specifications listed herein such that no individual component will be less than specifications for permanent link and channel, regardless of the fact that tests for link and channel ultimately meet required specifications.
5. In the event of a breach of the representations and warranties contained herein, the Contractor, at their own expense, shall take all measures necessary to make the cabling system work and comply with the applicable manufacturer written technical recommendations and standards.

B. Horizontal cables shall be installed in "dry" locations that provide protection from moisture levels above the intended operating range of inside plant (ISP) cables. "Slab-on-Grade" building designs wherein pathways are installed underground on/in the poured concrete slabs that are in direct contact with the soil are considered wet locations and hence are not permitted.

1. Cable pathways shall be installed to provide protection from the elements (i.e. moisture) and other hazards.
2. Pathways shall not have exposed sharp edges that may come into contact with telecommunications cables. Cables exiting the pathway will be routed over a bend delimiter (waterfall) designed by the tray manufacturer for that purpose.

C. Pathways shall not be located in elevator shafts.

D. Grounding / Earthing and bonding of pathways shall comply with applicable codes and regulations. It is recommended that the requirements of IEC/TR3 61000-5-2 - Ed. 1.0, ANSI-J-STD-607-B, or both be observed throughout the entire cabling system.

2.3 SURFACE MOUNTING

A. Surface Mount Cable Runs and Faceplate Boxes

1. Surface mounting of cable pathway runs and/or boxes for outlets/faceplates are only authorized as a last resort and exception to running cables through the wall and above the ceiling.
2. If surface mount cable runs are used:

- a. Burrs will be removed from the inside of the plastic or metal surface mount cable runs to prevent damage to cables pulled through the run.
- b. Raceway manufacturer plastic bushings shall be installed at all outlet openings in raceway to prevent damage to cable.
- c. "T", Splice, and corner pieces will be used to join runs. Runs will not be butted together without the appropriate joining pieces.

PART 3 - EXECUTION:

3.1 HORIZONTAL PARAMETERS

A. Allowable Cable Bend Radius And Pull Tension:

1. In general, communications cable cannot tolerate sharp bends or excessive pull tension during installation.
 - a. Bend radius for 4 pair UTP and F/UTP under no load (no pulling tension) shall not exceed four (4) times the outside diameter of the cable and eight (8) times the outside diameter of the cable under load (110N/25lbf). Note: Cable bend radius and pulling tensions for cables other than 4 pair cable increase with the diameter and type of cable refer to the manufacturer's recommendations for specific requirements.
2. After installation, exposed cable and other surfaces must be cleaned free of lubricant residue. Use only lubricants specifically designed for cable installation.

B. Pull Strings:

1. Horizontal and Vertical Pathways
 - a. The pathway installer shall:
 - 1) Provide pull strings in all new conduits, including all conduits with cable installed as part of this contract.
 - 2) Provide pull strings in all new cable trays
 - 3) Pull string shall have a rated average breaking strength of 200 pounds.
 - 4) Data and video cables can be pulled in tandem with pull strings. During pulling sessions, pull strings must move freely to prevent cable jacket/cable damage.
 - 5) Replace pull strings in all locations where they are utilized as part of this contract.

C. Conduit Fill:

1. Reference manufacturer's Design Installation Guidelines manual.
2. Comply with requirements of NFPA 70 (NEC)
3. The number of cables placed in a pathway shall not exceed manufacture specifications, nor, will the geometric shape of a cable be affected.
 - a. Conduit pathways shall have a maximum fill ratio of 40% to allow for proper pulling tension and lay of the CAT6A F/UTP cable. A minimum of a 1" diameter conduit is recommended for new construction. Existing conduits will require the reduction of the number of cables placed in the conduit to meet the required fill ratio.

3.2 INTRA-BUILDING CABLE ROUTING

A. Pathways

1. The backbone subsystem shall include cable installed in a vertical manner between floor telecommunications rooms and the main or intermediate cross-connect in a multi-story building and cable installed horizontally between telecommunications rooms and the main or intermediate cross-connect in a long single story building.

2. Adequate riser sleeve/slot space shall be available with the ability to ingress the area at a later date in all telecommunications rooms, such that no drilling of additional sleeves/slots is necessary. Proper fire stopping is required for all sleeves/slots per national and local codes. Install fire stop material designed specifically for the building construction conditions and to meet the existing fire stop material as directed by the building engineer.
3. Backbone pathways shall be installed or selected such that the minimum bend radius of backbone cables is kept within manufacturer specifications both during and after installation.
4. Where redundant paths are required, they shall be separated by a minimum of 24".
 - a. Separate innerducts are required for each leg of the redundant path.
 - b. Separate physical routing for each path shall be utilized where possible.
5. Building backbone cables shall be installed in "dry" locations that provide protection from moisture levels above the intended operating range of inside plant (ISP) cables. "Slab-on-Grade" building designs wherein pathways are installed underground on/in the poured concrete slabs that are in direct contact with the soil are considered wet locations and hence are not permitted.

B. Media

1. The backbone cables shall be installed in a hierarchical star topology, emanating from the Campus Distributor/Main Cross-connect (CD/MC) to each Floor Distributor/Horizontal Cross-connect (FD/HC) in all telecommunication rooms. Building Distributor/Intermediate Cross-connects (BD/IC) may be present between the Campus Distributor/Main Cross-connect (CD/MC) and the Floor Distributor/Horizontal Cross-connect (FD/HC).
2. Unless otherwise recommended by the manufacturer, all fiber cables will be run in innerduct.
 - a. Armored fiber optic cable shall not require innereduct.
3. Fibers will be terminated in the telecommunications rooms using SC and LC connectors in wall mounted interconnect centers or rack mounted panels equipped with sufficient ports, slack storage space and splice trays if required to terminate and secure all fibers. ST connectors are no longer recommended in the TIA 568-C.3 standard, but may be used in legacy installations.
4. At least one 4-pair balanced twisted-pair hybrid/bundled or multi-pair cable should be run for each Intra-building/Building backbone segment. Optical fiber shall be installed for any backbone segment greater than 90 m (295 ft.). If the Intra-building/Building Backbone segment is less than 90 m (295 ft), and fiber is not installed, then a balanced twisted-pair cable of CAT6A F/UTP cable shall be installed for each known application.

END OF SECTION

SECTION 27 0529

HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

- A. NOT USED

PART 2 - PRODUCTS

2.1 APPROVED PRODUCT

- A. The J-hooks shall meet or exceed the below characteristics of construction and features
 1. Provide broad based support for cabling to aid in maintaining overall system performance.
 2. Be available in 50.8mm (2") and 101.6mm (4") options
 3. Come equipped with a cable retention clip
 4. Offers a full line of mounting accessories.

2.2 APPROVED MANUFACTURERS

- A. Siemon
- B. Ericson / Caddy
- C. B-Line
- D. CTS
- E. Stiffy

PART 3 - EXECUTION

3.1 J-hooks and other supports shall be installed such that they:

- A. Shall be supported with devices designed for this purpose and shall be installed independently of any other structural component. J-Hooks shall not use the suspended ceiling support wires or lighting fixture support wires.
- B. The number of cables placed into the J-hooks shall be limited to a number that will not cause a change to the geometric shape of the cables.
 1. Limit to a 40% fill in new construction.
- C. J-hooks shall not be spaced farther than 1.5 meters (5 ft.) apart, with a recommendation that they be spaced at 1 meter (3 ft.) apart. Note: Construction may require distances to exceed the maximum and are considered an exception requiring approval of project manager or building engineer.
- D. J-hooks or better must be installed without exception.

3.2 Unacceptable Installations

- A. Free flight of cables
- B. Resting or attaching of cables on pipes, conduits, HVAC duct work
- C. Resting on or attached to fire sprinkler systems
- D. Resting on ceiling tile grid in ceiling space is not acceptable.

END OF SECTION

SECTION 27 0533

CONDUITS AND BACK BOXES FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 NOT USED

PART 2 - PRODUCTS

2.1 APPROVED PRODUCT

- A. Conduits and Back boxes shall meet the construction requirements of the NEC for the type of structure and space in which they are installed and will be of the diameter and size to provide adequate fill, bend radius and connector space. Refer to section 270528.
- B. Coordinate with Division 26 for the exact required conduit size and back box dimensions as they relate to the specific telecommunication cable and connectors.

PART 3 - EXECUTION

3.1 CONDUIT SIZING

- A. Conduit size shall be based on the type of cable installed and the required fill ratio and bend radius associated with the type of cable specified.
 - 1. Minimum conduit size to back box for CAT6A F/UTP shall be 1 inch
- B. Conduit and installation shall be provided by Division 26.
- C. All conduit stubs shall be installed with plastic bushings appropriate for the size of conduit used.
- D. Conduits that stub to accessible ceiling shall be installed in the direction to provide the shortest path to the TDR, complete with pull string

3.2 BACK BOX SIZING

- A. New work back boxes for CAT6A F/UTP shall be a minimum of trade size 4-11/16" x 4-11/16" x 3" (depth) plus a 5/8" plaster ring to allow for proper bend radius and connector termination/installation. Side knockouts shall be avoided.
- B. Back boxes for rework shall meet the same specification as for new work.
 - 1. If existing back boxes or back boxes that are smaller due to construction restrictions, then devices such as extension rings, bezels or faceplates shall be used to modify the back box to insure proper bend radius and connector termination/installation.
 - a. Verification and approval of the size change must have DCO Infrastructure Cabling and engineering approval.

3.3 BACK BOX COMPOSITION

- A. All back boxes for IT systems shall be UL/CSA listed and approved for the purpose.
 - 1. Non-metal back boxes shall not be used for any interior IT related device.

3.4 SPECIAL CONDITIONS – LEAD LINED WALLS FOR RADIATION CONTROL

- A. Refer to the complete IT Lead Lined Wall Procedure – Attachment to Appendice

END OF SECTION

SECTION 270536

CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 COORDINATION

- A. Prior to beginning installation, a kick-off meeting to properly coordinate the tray installation and expectations should be held. It should be arranged by the General Contractor, and at a minimum include representatives of the following trades: FP&D, Electrical (Div 26), Structured cable, Nurse Call, paging, building automation and control, plumbing, HVAC, fire sprinkler, framing, and others as applicable. The DCO Infrastructure Cabling Team will lead the meeting.
- B. The wire basket tray routing shall be approved by the network cable contractor (Div 27sub-contractor), and the DCO.
- C. Triple tier J-Hook pathways shall parallel the basket trays for other services
 - 1. The triple tier J-Hooks shall be installed by the cable tray installer.
- D. Single J-Hooks as needed to extend beyond the triple tier, shall be installed by the trade that will be utilizing them.
- E. Cable tray shall be a high priority installation to allow adequate time for proper and complete cable installation prior to ceiling grid.

PART 2 - PRODUCTS

2.1 APPROVED PRODUCT

- A. The Cable Tray shall meet or exceed the below characteristics of construction and features:
 - 1. To be fully welded and available in a galvanized silver or powder coat black finish
 - 2. Be available in standard depths of 50.8mm (2"), 101.6mm (4") and 152.4mm (6").
 - 3. Be available in standard widths ranging from 101.6mm (4") up to 600mm (24")
 - 4. Be available in a "self-supporting" under floor option.
 - 5. Have an optional construction using "elongated" shaped wires offering a more broad based support for installed cables.
 - 6. Have a full line of mounting and splicing accessories.
 - 7. Cable ladder shall be used in data rooms for horizontal management above the racks.
 - 8. Ladder shall match the manufacturer of the data racks where practical
 - 9. Ladder shall be 24 inch wide
 - 10. Ladder shall be assembled with manufacturer approved parts and methods.

2.2 PART NUMBERS (SUBMITTAL REQUIRED)

- A. Cable Tray -
 - 1. WBT – Wire Basket Tray (preferred)
 - 2. Siemon RouteIT™ Wire Mesh Cable Tray, or equal basket type tray

- B. Ladder rack - Shall match rack manufacturer, or exact equal.

PART 3 - EXECUTION

3.1 PATHWAY INSTALLATION

A. Supports

1. Installed per Manufacturer's Specifications and utilize components specific to the maintenance of proper access in and out of the cable tray by the use of bend delimiters.
2. Distance between supports shall not exceed 8 feet
 - a. Less distance between supports required if per manufacturer's instructions.
3. Supports shall be of the trapeze design to provide maximum stability
 - a. Each support shall attach to structure via its own hangers.
 - 1) All hanger supports shall be constructed of a rigid material such as all-thread
 - 2) All hangers and supports shall be installed perpendicular and plumb to the tray, No angle supports shall be permitted unless augmented perpendicularly.
 - 3) Where hangers for other equipment such as duct work have been provided due to path to structure being blocked
 - 4) Supported by devices that are designed for that purpose and are installed independent of any other system components.
 - 5) Provide vibration and sway (seismic) damping
 - 6) Provide support across width of tray underneath, not via basket side wires.
 - 7) Walls are not considered to qualify as a support.
4. Supports shall be of sufficient strength to support at least 200% of the expected load
5. Wall mounted angle brackets shall not be used as the sole support for cable tray.

B. Complete system access

1. Cable tray shall have a dedicated free clearance zone surrounding it.
 - a. 12" clear space shall be provided on the side where natural feed will occur
 - b. 6" clear space shall be provided on the side opposite the feed access
 - c. 6" clear space above the top of tray
 - d. 3" clear space below the tray
2. Exception: other services may pass through the free clearance zone provided it is perpendicular to the tray direction and providing they do not exceed 6" in width, or interfere with the access to pull wire in the tray

3.2 ROUTING OF BASKET TRAY

- A. Exact cable tray location shall be coordinated with other trades to ensure proper clearances and access. Prior to installation, final cable tray routing must be approved by the Owner's Data Center Operations team; or if an IMG facility, by IMG IT Support.
- B. Cable tray shall be installed in straight lines, either parallel or perpendicular to building lines
- C. Cable tray shall follow corridor paths
 1. Routing above rooms and other partitions shall be avoided
- D. Cable tray and flush penetrations shall be utilized over hard-lid areas

- E. Access panels shall be provided where needed to provide access to the cable tray on both sides of wall in hard lid areas

3.3 TRAY INTEGRITY

- A. Tray shall be installed as a complete, continuous system with no open spaces of missing segments. Bonding between sections shall be accomplished by the manufacturer's approved clamp or designated method.
- B. Tray shall be free from obstructions, other systems, trash or debris. Access to the tray shall be provided as outlined.
- C. Tray must not be notched or cut-out to accommodate other trades. Repairs will not be accepted. Section replacement will be required at no cost to Intermountain.
- D. As much tray material as possible shall be left uncut at turns, junctions, elevation changes, width changes, etc. Overlap shall be clamped to maximize strength.

3.4 WALL OR OTHER PENETRATIONS (SUBMITTAL REQUIRED)

- A. Fire and smoke rated assemblies
 - 1. Penetrations shall comply with all fire and smoke prevention methods per codes and as outlined elsewhere in this document
- B. Approved penetration methods
 - 1. Preferred barrier penetration method shall be to run the tray continuous through the barrier, with closure provided by Firestop pillows.
 - a. Framing shall be boxed around opening to permit proper pillow insertion.
 - 2. Sleeves or conduits
 - a. EZ-Path or alternate penetrations must provide 150% of the cross-section area of the basket.
 - b. Conduit permitted only with written pre-bid permission or engineering notation on the drawings.
 - c. Each penetration sleeve or conduit shall be bonded on both sides of the penetrated barrier using UL and AHJ approved methods..
 - 3. All penetrations shall be positioned in-line with the cable tray to facilitate ease of pulling conductors and provide a straight line path.
 - a. The bottom of the penetration device shall be flush with the bottom of the cable tray
 - b. Side-to-side the penetration device must be 100% within the cable tray space
 - 4. Approved penetration devices shall be a minimum size of 4"
 - a. Total penetration space at each location shall be sized for 20% future growth
 - 5. Approved devices are listed in order of preference:
 - a. Fire rated STI EZ-Path
 - b. Hilti self-sealing device
 - c. Tray with enclosed wall and properly sized and installed pillows
 - d. Conduit sleeves
 - 1) conduit sleeves should only be used as a last resort upon approval from owner's DCO Infrastructure Cabling representative

3.5 UTILIZATION

- A. Capacity

1. Trays and penetration devices shall be properly sized
 - a. Provide a maximum calculated fill ratio of 40% to an inside depth not to exceed 3 inches (75 mm)
 - b. Provide capacity to allow for at least 20% future growth
- B. Systems served
 1. Cable trays, J-hooks, and penetrations shall be dedicated to a single system. Mixing of other systems with voice and data shall not be permitted in tray or J-hook paths.
 2. Exception: Different systems may share cable tray providing the following conditions are met:
 - a. Less than 40% overall fill is maintained, plus 20% additional space for growth
 - b. And there is a minimum 3" separation between systems
 - c. Or there is a grounded physical divider between systems
- C. Restricted content in trays
 1. The wire basket tray shall only contain cables for the voice and data communications systems.
 - a. If there is sufficient space in the tray, and with approval from both the data network sub-contractor and the DCO, certain other IP services may share tray space. (i.e. camera, telemetry, similar.
 - b. Rauland nurse call cabling may be run in V/D tray. All other manufacturers must provide their own path.
- D. Triple J-Hook patch assignments
 1. The Middle tier of the triple J-Hook path may alternately utilized for Nurse Call
 - a. Or any other EMI producing systems.
 2. The Lower tier of the triple J-Hook path is designated for Card Access and building automation and controls
 3. The Top tier of the triple J-Hook path is designated for DAS or similar systems.

END OF SECTION

SECTION 27 0539

SURFACE RACEWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 NOT USED

PART 2 - PRODUCTS

2.1 APPROVED PRODUCT

- A. Surface Raceway shall be suitable for the type of environment in which they are to be installed such as plenum and non-plenum. They should also be manufactured of materials that will provide maximum protection of the cables after installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Surface Raceway Installation

1. Maximum Surface Raceway fill ratio shall not exceed 40% fill at the initial installation, with a maximum fill ratio of 60% fill to accommodate unplanned additions after the initial installation. Note: This ratio also applies to modular furniture raceways.
2. Supported and installed per manufacturer's specifications and utilize components specific to the maintenance of proper access in and out of the cable tray by the use of plastic bushings, bezels or faceplates.

END OF SECTION

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SECTION 270553

IDENTIFICATION FOR LOW-VOLTAGE CABLES AND LABELING

PART 1 - GENERAL

1.1 NOT USED

PART 2 - PRODUCTS

2.1 LABELING

- A. Structured cabling shall be labelled in accordance with ANSI/TIA 606-B standards.
- B. A unique identifier shall be marked on each faceplate to identify it as connecting hardware.
- C. Each port in the faceplate shall be labeled with its identifier.
- D. A unique identifier shall be marked on each piece of connecting hardware to identify it as connecting hardware.
- E. Each port on the connecting hardware shall be labeled with its identifier.
- F. Cable Labeling
 - 1. Label System
 - a. Labels Identification (Labeling) System:
 - 1) Brady
 - 2) Dymo
 - 3) Hellerman-Tyton
 - 4) Panduit
 - 5) Acceptable alternate
 - a) Approval from Data Center Operations Infrastructure Cabling team member required prior to bid
 - 2. Cable Labels
 - a. Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.
 - b. Each end of the Horizontal cables shall be labeled with a mechanically generated label within 300mm (12 in) of the end of the cable jacket with the link identifier which shall be a unique configuration determined by Intermountain Healthcare. This also applies to the Backbone Cables.
 - 3. Flat-surface labels
 - a. Self-adhesive vinyl or vinyl-cloth labels, machine printed with alphanumeric cable designations
 - 4. Contractor shall:
 - a. Provide transparent plastic label holders, and 4-pair marked colored labels.
 - b. Install colored labels according to the type of field as per ANSI/TIA 606-B.1 color code designations.
- G. PALLETTE
 - 1. Use the Intermountain Healthcare color-code guidelines for voice, data, cross-connect, riser, and backbone fields. Otherwise, use the ANSI/TIA 606-B designation strip color-

code guidelines for voice, data, cross-connect, riser, and backbone fields. Color designations for F/UTP cable:

a. Intermountain Healthcare Standard Wiring Palettes for Horizontal Cabling

b. Use	Color
1) Data & IP Phones	Blue
2) Analog Phone	Blue
3) Security Card Readers	Grey
4) IP Security Cameras	Blue
5) Fire Systems	Red
6) TV Coax	Black
7) Public Address	White
8) Clinical Engineering –	Orange
a) Monitoring, Bed Systems	Orange
b) Nurse Call	Orange
9) Wireless	Yellow
10) Foreseer (Belden 1422)	Red

H. Outlet/Jack/Faceplate Icons/labeling will match the color of the cable attached to the back side of the outlet/jack.

PART 3 - EXECUTION

3.1 GENERAL IDENTIFICATION

- A. Installer shall label all cable, regardless of length.
- B. Identify system components, wiring, and cabling complying with TIA/EIA-606-B. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- C. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.
- D. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions.
- E. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- F. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- G. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications rooms, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-B. Furnish electronic record of all drawings, in software and format selected by Owner

3.2 CONCEALED ENDS

- A. Jacks, connectors, terminations, and similar that are located in concealed locations such as above grid ceilings, shall have additional labeling. The additional label shall be on the face of the grid in a visible location, immediately adjacent to the termination location.

3.3 CABLE AND WIRE IDENTIFICATION

- A. Label each cable visibly within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
- B. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
- C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 - 1. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building mounted device shall be identified with name and number of particular device as shown.
 - 2. Label each unit and field within distribution racks and frames.
- D. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-B

END OF SECTION

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SECTION 27 1100

EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section outlines the levels of telecommunications rooms and distribution points. It is a guide for each type of room, and the requirements and necessary fit up equipment for each.

PART 2 - PRODUCTS

2.1 COMMON REQUIREMENTS

- A. Rack layout and mounting
 - 1. Standard room layouts are located in the appendices
- B. Rack and wall mounting locations
 - 1. Rack and wall space use is pre-designated at the design stage. Before mounting any equipment on a wall or in a rack, the location must be verified by the Div 27 sub-contractor and the DCO.

2.2 ADDITIONAL TECHNOLOGY ROOM SPECIFIC REQUIREMENTS (TDR)

- A. Definition
 - 1. Technology distribution rooms (TDRs) provide a secure, flexible, and easily managed location for the structured wiring systems, network electronics, clinical systems, nurse call systems, and other technology and communications equipment throughout the building. TDRs house a variety of technology systems and system components.
 - a. There shall be a minimum of one TDR on each floor of the facility. TDRs shall be provided throughout the facility as necessary to meet the 292-foot (90-meter) maximum cable distance required for Ethernet cables.
 - 1) A maximum 250 foot radius is recommended to allow for corners and vertical cable travel.
 - b. This room is where the signals from the servers or phone switches (PBX) are split out and routed to the individual user's office or workspace.
- B. Alternate and Previous Reference Names
 - 1. Data Closet or Data Room
 - 2. Communications (Com) Room or Closet
 - 3. IDF (Independent or Intermediate Distribution Frame)
 - 4. Edge Closet
 - 5. Telecommunications Room
 - 6. Equipment Room

2.3 TECHNOLOGY EQUIPMENT CENTER (TEC)

A. Definition

1. The technology equipment center (TEC) houses the main networking equipment and the application servers and data storage devices that serve the building.
 - a. Each hospital shall have at least one TEC space that is not used for any purposes other than data storage, processing, and networking.

B. Alternate and Previous Reference Names

1. Data Center
2. Switch Room
3. Server Room
4. Equipment Room
5. MDF (Main Distribution Frame)
6. IDF (Intermediate Distribution Frame)

2.4 TELECOMMUNICATION SERVICE ENTRANCE ROOM (TSER)

A. Definition

1. The telecommunications service entrance room (TSER) houses the point at which data and voice circuits and services enter the facility and outdoor cabling interfaces with the building infrastructure.
 - a. Each hospital shall have at least one TSER that is dedicated to the telecommunications function and related support facilities.

B. Alternate and Previous Reference Names

1. Service Entrance
2. Entrance Facility
3. Data Center
4. Switch Room
5. D-Marc
6. MDF (Main Distribution Frame)

2.5 SECURITY / AUDITABLE ACCESS CONTROL REQUIREMENTS

- A. The access control system shall be auditable

PART 3 - EXECUTION

3.1 COMMON REQUIRED CHARACTERISTICS FOR TDR, TEC, & TSER

A. PURPOSE - COMMON

1. Each type of Technology Room serves a different purpose. There are some common requirements, and some specific to the type of room.

B. SECURITY - COMMON

1. Any visitor, vendor, or contractor requiring access to a Technology Room, who does not have appropriate approvals or clearances, must be escorted by a properly credentialed tech from the appropriate system.
2. Whenever there is the ability to gain physical access to the network equipment, there is a greater risk of data compromise, loss, or damage. The main technology equipment should be secured in a dedicated, locked Technology Room.

3. Unused access jacks should be disconnected from the patch panels, and unused switch ports disabled. These security measures need to occur within a secure Technology Room.
4. The Technology Rooms shall be dedicated to the telecommunications function.
5. Access to the Technology Room shall be restricted to authorized service personnel and shall not be shared with building services that may interfere with the main networking interfaces, the networking equipment, the application servers, data storage devices, and telecommunications equipment systems.
6. Technology Rooms shall not be used for building maintenance services, custodial services, or be used for general storage.
7. Security cameras shall be installed in each Technology Room.
 - a. At entrances
 - b. At the end of each row of equipment racks
 - c. In electrical and mechanical rooms serving the Technology Room
8. Cable shall be installed according to the standards herein at each of the designated locations.
9. Access to a Technology Room shall be restricted, and controlled by an auditable access control system. The access control system shall comply with the requirements of SECTION 271100: PART 2 – PRODUCTS paragraph 2.5 and subparagraphs thereof.
10. All secure data areas must be secured by an auditable badge reader system. In addition to the badge reader the mechanical key must be replaced with an auditable “electronic key” manufactured by Medeco. The mechanical cylinder in the lockset must be replaced with a Medeco XT cylinder.
 - a. Approved system:

	Part Number:
1) 1 ¼ Mortis cylinder	100500G
2) 1 3/8 Mortis cylinder	105100G
3) Rim cylinder, horizontal tailpiece	100400HG
4) Rim cylinder, vertical tailpiece	100400VG
5) Schlage cylinder	20200S1G
6) Small Format Interchangeable Core	EA-100108
7) Large Format Interchangeable Core	Contact Supplier
 - b. Approved supplier:
Intermountain Lock and Security Supply / 3106 S Main St / Salt Lake City, UT 84115 / 801-486-0079
 - c. Owner of security locks and badge readers:
Intermountain Healthcare Data Center
 - d. For programing on the Medeco XT Electronic Keys contact:
Intermountain Healthcare Data Center

C. PHYSICAL ENVIRONMENT

1. The Technology Room shall be located in a dry area not subject to flooding and should be as close as possible to the electrical service room in order to reduce the length of the bonding conductor to electrical grounding system.
2. The Technology Room shall be located in an accessible, non-sterile area.
3. Access to the Technology Room shall be directly off a corridor and not through another space.
4. The Technology Room should be located to avoid large ducts, beams, and other building elements that may interfere with proper cable routing and may limit future access.
5. Mechanical and electrical equipment or fixtures not directly and exclusively related to the support of the Technology Room shall not be installed in, pass through, or enter the Technology Room.
6. Technology Rooms will have an epoxy sealed concrete floor or static dissipative flooring installed.

3.2 TECHNOLOGY DISTRIBUTION ROOM (TDR) / DATA CLOSET

A. PURPOSE

1. The TDR (Technology Distribution Room) is generally considered to be a floor serving facility. The Horizontal Cross-connect links the Horizontal Subsystem and the Backbone Subsystem together.
2. The TDRs shall be provided throughout the building and located to facilitate the 90m (290 ft.) permanent link for Ethernet applications.
 - a. Note that the AIA/State requirements specify that the minimum size for a TDR is 12' by 14'; and recommend 12' by 16' to allow for growth.
 - b. See appendix 10 for other systems that may be installed in this space, and appendix 11 for capacity, required clearances, and layout.
 - c. Doors shall swing out of the room to provide maximum available space and rapid egress.
3. The TDRs shall be primarily equipped to contain telecommunications equipment, cable terminations, and associated cross-connects.
4. If space permits, the TDR may host other telecommunications related services such as nurse call, physiological monitoring, medical telemetry, wireless networking, fire and security alarms, card access, security surveillance systems, building automation systems, overhead paging, individual paging, emergency radio frequency amplification, distributed antenna systems, entertainment distribution systems (i.e. TV), guest media services, digital signage, cellular amplification, and various other network and communication system equipment and cabling.
 - a. See Appendix 10 for other systems potentially installed in this space.

B. ELECTRICAL ENVIRONMENT

1. Separation from sources of EMI shall be in accordance with ANSI/TIA/EIA-569-C and local codes.
2. Communication grounding/earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC/TR3 61000-5-2 - Ed. 1.0, ANSI-J-STD-607-C, or both be observed throughout the entire cabling system.
 - a. All racks, equipment frames, furniture, flooring, ductwork with in the IT space will be bonded to the Central Ground bar.
 - 1) No AC electrical equipment bonding will be done at the Central Ground Bar. AC electrical grounding and bonding will be done according to the NEC.
3. Some TDRs will require redundant power and data feeds, while others are fine with a small UPS and a single data line.
4. Lighting in the TDRs should be a minimum of 500 lx (50 foot candles) at the lowest point of termination.
 - a. Light switch should be easily accessible when entering the room.
 - b. Lighting will be fed from the generator system or have fixtures with battery backup.
5. A minimum of two dedicated duplex or two dedicated simplex electrical outlet, each on a separate 120V 20A circuit, should be provided for equipment power. Additional convenience duplex outlets should be placed at 1.8 m (6 ft) intervals around the perimeter walls.
 - a. Only twist loc receptacles will be used for rack power points. Type 6-30R
6. All power is to originate from the facilities generator backup system with one system (A-B) originating from the critical system.
7. All circuits serving the TDR and the equipment within it shall be dedicated to serving the TDR.
8. TDRs shall be connected by a backbone of insulated, #6 (minimum) to 3/0 AWG stranded copper cable between all technology rooms.

C. MECHANICAL ENVIRONMENT

1. Reliable cooling shall be provided.

- a. Based on criticality tiering structure individual rooms may require redundant, concurrently maintainable cooling systems.
- b. Tier structure level shall be determined from Section 271100 Part 2.4
2. Heat load shall be calculated at 4KW per equipment rack
3. Temperature and humidity in the TDR shall be controlled to an operating range of 64 to 75 degrees F (18 to 24 degrees C) with 30 to 55 percent relative humidity.

D. EQUIPMENT

1. The Horizontal Cross-connect shall consist of rack or wall mounted wiring blocks or panels for termination of copper cables or rack or wall mount interconnect centers or fiber management panels/trays for the termination of optical fibers.
2. Cross-connect spaces include the labeling of hardware for providing circuit identification and patch cords or cross-connect wire used for creating circuit connections at the cross-connect.
3. Each TDR shall be connected to the TEC (Technology Equipment Center) to provide a building-wide network and communications system.
4. All racks, cabinets, sections of cable tray, and metal components of the technology system that do not carry electrical current shall be grounded.
5. Racks shall be installed with their fronts towards the door.

3.3 TECHNOLOGY EQUIPMENT CENTER (TEC) / DATA ROOM

A. PURPOSE

1. The TEC (Technology Equipment Center) equipment subsystem consists of shared (common) electronic communications equipment in the TEC or the TSER (Telecommunication Service Entrance Room) and the transmission media required to terminate this equipment on distribution hardware.
2. The TEC shall be equipped to contain telecommunications equipment, cable terminations, and associated cross-connects.
3. Each facility shall have at least one TEC space that is not used for any purposes other than data storage, processing, and networking and that meets the minimum requirements of this section
4. The TEC shall be a size adequate to provide proper space to meet service requirements for the equipment that will be housed there.
 - a. Doors shall swing out of the room to provide maximum available space and rapid egress.
5. Combination of the TEC and the telecommunications service entrance room (TSER) shall be permitted.

B. ELECTRICAL ENVIRONMENT

1. Separation from sources of EMI shall be in accordance with ANSI/TIA/EIA-569-B and local codes.
2. Communication grounding/earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC/TR3 61000-5-2 - Ed. 1.0, ANSI-J-STD-607-B, or both be observed throughout the entire cabling system.
 - a. All racks, equipment frames, furniture, flooring, ductwork with in the IT space will be bonded to the Central Ground bar.
 - 1) No AC electrical equipment bonding will be done at the Central Ground Bar. AC electrical grounding and bonding will be done according to the NEC.
3. Some TECs will require redundant power and data feeds, while others are fine with a small UPS and a single data line.
4. Lighting in the TECs should be a minimum of 500 lx (50 foot candles) at the lowest point of termination.
 - a. Light switch should be easily accessible when entering the room.
 - b. Lighting will be fed from the generator system or have fixtures with battery backup.

5. A minimum of two dedicated duplex or two dedicated simplex electrical outlet, each on a separate 120V 20A circuit, should be provided for equipment power. Additional convenience duplex outlets should be placed at 1.8 m (6 ft) intervals around the perimeter walls.
 - a. Only twist loc receptacles will be used for rack power points.
6. All power is to originate from the facilities generator backup system with one system (A-B) originating from the critical system.
7. All circuits serving the TEC and the equipment within it shall be dedicated to serving the TEC.
8. TECs shall be connected by a backbone of insulated, #6 (minimum) to 3/0 AWG stranded copper cable between all technology rooms.

C. MECHANICAL ENVIRONMENT

1. Reliable cooling shall be provided.
2. Heat load shall be calculated at 4KW per equipment rack
3. Temperature and humidity in the TEC shall be controlled to an operating range of 64 to 75 degrees F (18 to 24 degrees C) with 30 to 55 percent relative humidity.

D. EQUIPMENT

1. Each TEC shall be connected to the TSER (Telecommunications Service Entrance Room) to provide an enterprise-wide network and communications system.
2. All racks, cabinets, sections of cable tray, and metal components of the technology system that do not carry electrical current shall be grounded.
3. Racks shall be installed with their fronts towards the door.

E. FIRE SUPPRESSION

1. A TEC shall have a pre-action fire suppression system installed.
2. Heads within a TEC shall be 200 degree as permitted by the AHJ.

3.4 TELECOMMUNICATION SERVICE ENTRANCE ROOM (TSER) / D-MARC

A. PURPOSE

1. The TSER (Telecommunications Service Entrance Room) equipment subsystem consists of shared (common) electronic communications equipment in the TEC or the TSER required to interface this equipment and distribution hardware to the transmission media of enterprise Wide Area Network (WAN) infrastructure.
2. The TSER shall be equipped to contain telecommunications equipment, cable terminations, and associated cross-connects.
 - a. Note that the AIA/State guidelines specify that the minimum size for a TSER is 12' by 14'.
 - b. Doors shall swing out of the room to provide maximum available space and rapid egress.
3. The TSER shall be dedicated to the telecommunications function.

B. ELECTRICAL ENVIRONMENT

1. Separation from sources of EMI shall be in accordance with ANSI/TIA/EIA-569-B and local codes.
2. Communication grounding/earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC/TR3 61000-5-2 - Ed. 1.0, ANSI-J-STD-607-A, or both be observed throughout the entire cabling system.
 - a. All racks, equipment frames, furniture, flooring, ductwork with in the IT space will be bonded to the Central Ground bar.
 - 1) No AC electrical equipment bonding will be done at the Central Ground Bar. AC electrical grounding and bonding will be done according to the NEC.
3. Most TSERs will require redundant power and data feeds.

4. Lighting in the TSER should be a minimum of 500 lx (50 foot candles) at the lowest point of termination.
 - a. Light switch should be easily accessible when entering the room.
 - b. Lighting will be fed from the generator system or have fixtures with battery backup.
 5. A minimum of two dedicated duplex or two dedicated simplex electrical outlet, each on a separate 120V 20A circuit, should be provided for equipment power. Additional convenience duplex outlets should be placed at 1.8 m (6 ft) intervals around the perimeter walls.
 - a. Only twist lock receptacles will be used for rack power points.
 6. All power is to originate from the facilities generator backup system with one system (A-B) originating from the critical system.
 7. All circuits serving the TSER and the equipment within it shall be dedicated to serving the TSER.
 8. The TSER shall be connected by a backbone of insulated, #6 (minimum) to 3/0 AWG stranded copper cable between all technology rooms.
- C. MECHANICAL ENVIRONMENT
1. Reliable cooling and heating shall be provided.
 2. Temperature and humidity in the TSER shall be controlled to an operating range of 64 to 75 degrees F (18 to 24 degrees C) with 30 to 55 percent relative humidity.
- D. EQUIPMENT
1. The TSER (Telecommunications Service Entrance Room) shall be connected to the specified WAN equipment to provide connectivity to the enterprise-wide network and communications system.
 2. All racks, cabinets, sections of cable tray, and metal components of the technology system that do not carry electrical current shall be grounded.
 3. Racks shall be installed with their fronts towards the door.

END OF SECTION

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SECTION 271116

CABINETS, RACKS, FRAMES, AND ENCLOSURES

PART 1 - GENERAL

1.1 NOT USED

PART 2 - PRODUCTS

2.1 APPROVED PRODUCT

A. OPEN RACKS

1. For rack-mounted installations in a telecommunications room the installer shall use a 19 inch by 3 inch deep equipment rack.
 - a. Exception: Where other size cabinets are specified by design team at owner's direction
2. Part #: CPI 55053-703
 - a. Refer to Appendix #8 for current approved part numbers
3. Typical Standard Layout
 - a. Layout is 10" vertical manager, then 19" rack, then 10" vertical manager, then 19" rack, then 10" vertical manager.
 - b. Where more than 2 racks are called for, maintain the pattern of 10" vertical wire management on the ends, and 10" vertical management between racks.
4. Specifications:
 - a. Have 76 mm (3 in) by 76 mm (3 in) vertical cable channels as side rails in both .9 m (3 ft) and 2.1 m (7 ft) heights.
 - b. Have standard ANSI/EIA-310-C mounting holes having a full 45 RMS on front and back of rails. Cable routing openings shall be available in the front and rear of the channels.
 - c. Have floor mounting holes and a ground lug for 0-6 gauge ground cable provided.

B. CABINETS

1. Standard Cabinet
 - a. TBS Knurr PART # DK6B122IHCS
 - b. Specification: Liebert DCM, 600mm W x 1100mm D x 42U H, Perf Front Door, Split Perf Rear Door, 2 Side Panels, with 4) 3" x 12" cut outs with brush strips (2 front and back on both sides) vented roof, with 2) 4" Rack PDU mounting brackets installed.
2. Wall Mount Cabinet
 - a. <http://www.hubbellcatalog.com/hubbellpremise/datasheets/RE-BOX.pdf>
 - b. http://www.hubbellcatalog.com/hubbellpremise/datasheets/REBOX_Access.pdf
3. Blade UPS Cabinet
 - a. TBS Knurr PART # DK6B122IHCS(-ST-MB)
 - b. Specification: Liebert DCM, 600mm W x 1100mm D x 42U H, Perf Front Door, Split Perf Rear Door, 2 Side Panels, with solid top but no rack PDU mounting brackets installed where -ST means no slotted top and -MB means no mounting brackets
4. Rack Mount UPS Cabinet - Slotted Top
 - a. TBS Knurr PART # DK6B122IHCS(-MB)
 - b. Specification: Liebert DCM, 600mm W x 1100mm D x 42U H, Perf Front Door, Split Perf Rear Door, 2 Side Panels, with 4) 3" x 12" cut outs with brush strips (2 front and back on both sides) vented roof, with 2) 4" Rack PDU mounting brackets installed where -MB means no mounting brackets
5. FIBER ENCLOSURES

- a. All interconnect centers, panels and trays (units) shall provide cross-connect, interconnect, splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
- b. Part #:
 - 1) Siemon Rack Mount Interconnect Center (RIC3-48-01) (Required)
 - a) Quick-Pack adapter RIC-F-LCU12-01
 - b) Fiber Connector part numbers
 - (1) FC1M-LC-5L-B12 ----- (multi)
 - (2) Patch FC1M-LC-SM-B06 (Pre-Polished) ----- (SM)
 - (3) FC1LC-MM-B80
 - (4) FC1-LC-SM-B02 (Epoxy-Polished)
 - 2) Fiber Jumper FJ2-LCULCUL-(xx). (xx) To specify length
- c. Specifications:
 - 1) Feature compact 3 RMS (133.5mm [5.25 in.]) design
 - 2) Have integrated key-lockable front and rear transparent doors with single-finger latches and spring release hinges for removal.
 - 3) Have a sliding tray that can slide out the front and rear of the enclosure and be secured at multiple working positions as well as be fully removable for increased access.
 - 4) Have cable access points for fiber jumpers entering and exiting the unit with rotating grommets to facilitate cable loading and to minimize micro bending stress.
 - 5) Have labeling that can be viewed with doors open or closed and meets or exceeds ANSI/TIA/EIA-606-B requirements and also be laser printable.
- d. Splice enclosures shall be approved on a case-by-case basis.

PART 3 - EXECUTION

3.1 NOT USED

END OF SECTION

SECTION 27 1119

TERMINATION BLOCKS AND PATCH PANELS

PART 1 - GENERAL

1.1 NOT USED

PART 2 - PRODUCTS

2.1 APPROVED PRODUCT

A. PATCH PANELS

1. Part #:
 - a. Refer to Appendix #8 for current approved part numbers
 - 1) Siemon Z6AS-PA-24 24 port 1U Angled Patch Panel with jacks
 - 2) Siemon Z6AS-PA-48 48 port 1U Angled Patch Panel with jacks
 - 3) Siemon PNL-BLNKA-1 Blank Filler required between each patch panel
2. Specifications
 - a. To include Z-MAX™ Panel outlets.
 - b. Be available in both flat and angled configurations.
 - c. Come equipped with integrated rear wire management system
 - d. Be provided with high visibility snap-on magnifying label holders that contain paper labels or Z-MAX icons for port identification

PART 3 - EXECUTION

3.1 INSTALLATION

- A. For angled patch panels, the terminations shall cross in the back to maximize cable bend radius.

END OF SECTION

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SECTION 271123

CABLE MANAGEMENT AND LADDER RACK

PART 1 - GENERAL

1.1 NOT USED

PART 2 - PRODUCTS

2.1 CABLE MANAGEMENT

- A. Siemon
- B. CPI

PART 3 - EXECUTION

3.1 CABLE MANAGERS

- A. Cable Tie Wraps
 1. Tie wraps shall be used at appropriate intervals to secure cable and to provide strain relief at termination points.
 - a. Tie wraps shall not be used as cable support
 2. These wraps shall not be over tightened to the point of deforming or crimping the cable sheath.
 3. Tie wraps required by the manufacturer for the termination of cables at patch panels and work area boxes shall be installed per manufacturer's recommendations.
- B. Hook and loop cable managers
 1. Shall be used in the closets where reconfiguration of cables and terminations may be frequent.
 2. For dressing cables in Technology rooms
 3. Recommended.
 - a. Panduit
 - b. Owner pre-approved equal

END OF SECTION

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SECTION 27 1300

BACKBONE CABLING

PART 1 - GENERAL

1.1 DEFINITIONS

A. INTRA-BUILDING / BUILDING CABLING

1. The cable route within a building, connecting closet to closet or closet to the equipment room is referred to as the Intra-building/Building Backbone Subsystem. It links the Campus Distributor (CD)/ Main Cross-connect (MC) in the equipment room to Building Distributor (BD)/Intermediate Cross-connects (IC) and Floor Distributor (FD)/Horizontal Cross-connects (HC) in the Telecommunications Rooms (TR). It consists of the backbone transmission media between these locations and the associated connecting hardware terminating this media.

B. INTER-BUILDING / CAMPUS CABLING

1. When a distribution system encompasses more than one building, the components that provide the link between buildings constitute the Inter-building/Campus Backbone Subsystem. This subsystem includes the backbone transmission media, associated connecting hardware terminating this media, and electrical protection devices to mitigate harmful voltages when the media is exposed to lightning and/or high voltage power surges that pass through the building cable. It is normally a first-level backbone cable beginning at the main cross-connect in the equipment room of the hub building and extending to the intermediate cross-connect in the equipment room of a satellite building. Campus Backbone Subsystems require optical fiber cable to be installed to support high speed data applications.

PART 2 - PRODUCTS

2.1 PERMITTED BACKBONE MEDIA

- A. Siemon is the approved standard. Corning fiber may be substituted where Siemon product has unreasonable delay times, or doesn't make the required product. (Contractor to order early enough to allow Siemon at least a 2 - 3 week lead time.)
 1. Substitution must be pre-approved by ICT (Infrastructure Cabling Team Management)
- B. Cables allowed for use in the backbone include:
 1. 4-pair 100 Ω balanced twisted-pair copper in Categories 6, 6A & 7,(F/UTP, F/FTP, S/FTP) multi-pair 100 Ω balanced twisted-pair copper
 2. Hybrid or bundled 100 Ω balanced twisted-pair copper
 3. Multimode optical fiber 50/125 μ m (OM2), including 50/125 μ m Laser Optimized (OM3). Note: 62.5/125 μ m (OM1) is not recommend for backbone cabling due to the limited distance for gigabit and 10 gigabit applications and not recognized within the TIA942-A for 40/100 Gbp/s.
 4. Single-mode (OS1, OS2, OM4) optical fiber cables. (Data Centers must be OM4 or better)
- C. The cable shall support voice, data and imaging applications. The bending radius and pulling strength requirements of all backbone cables shall be observed during handling and installation.

- D. Multi-pair twisted pair cable is intended to support analog voice applications and shall be tested for continuity only.
- E. In addition to meeting the applicable performance specifications, all copper and optical fiber cable shall be appropriate for the environment in which it is installed.

2.2 MEDIA PRODUCTS

A. COPPER

- 1. The total channel length between the Campus Distributor/Main Cross-connect and to any Floor Distributor/Horizontal Cross-connect shall not exceed the following length limits for copper cabling:
 - a. 2,000 m (6,560 ft) for balanced twisted-pair for PBX/Class A (100 kHz) applications.
 - b. 200 m (656 ft) for balanced twisted-pair for Class B (≤ 1 MHz) applications.
 - c. 100 m (328 ft) for balanced twisted-pair categories 6, 6A & 7 (per Backbone segment when providing a two-level Backbone).

B. MULTIMODE OPTICAL FIBER

- 1. See Siemon website for supportable fiber distances
- 2. APPROVED PRODUCT
 - a. Part #: Siemon 9BB5(X)000B-T312A (R=OFNR)(P=OFNP) Note: 000B=Fiber Strand Count. Siemon XGLO Laser Optimized 50/125 μ m Fiber required.
 - b. Or armored equal (submittal required.)
 - c. Performance:
 - 1) Laser qualified 50/125 μ m multimode fiber optical fiber cables shall be in compliance with the following standards ISO/IEC 11801:2002 OM3, ANSI/TIA-568-C.3, ANSI/TIA-568-C.1 and Telcordia GR-409-CORE as well as the guaranteed application distances, attenuation, bandwidth, and group index of refraction requirements.
 - d. Specifications:
 - 1) Shall support 10GBASE-SX for all horizontal workstations, risers and short length backbone (<300 m) locations.
 - 2) Constructed for overfilled launch (OFL) and restricted mode launch (RML) bandwidth to ensure compatibility with both LED and laser light sources.
 - 3) Have an Aqua Outer Jacket and be available in cable ratings including OFNR and OFNP.

C. SINGLE MODE OPTICAL FIBER

- 1. See Siemon website for supportable fiber distances
- 2. Single-mode optical fiber cable shall be used for 1st and 2nd Level Backbone applications only.
- 3. APPROVED PRODUCT
 - a. Part #: 9BB8P012G-E205A (12 Strand); 9BB8P024LE205A (24 Strand)
 - b. Part #: 9BC8P012G-E205A (12 Strand); 9BC8P024L-E205A (24 Strand)
 - c. Performance
 - 1) Have OS1 and OS2 optical performance characteristics as determined by ANSI/TIA-568C.03 and ISO 11801-2010 2nd edition.
 - d. Specifications
 - 1) Have a Yellow colored round lead free cable jacket available in both OFNR and OFNP constructions.

PART 3 - EXECUTION

A. TOPOLOGY

1. The Backbone cabling shall use a conventional hierarchal star topology.
 - a. There shall be no more than two (2) levels of cross-connects between the campus distributor/main cross –connect (CD/MC) and any given floor distributor/horizontal cross-connect (FD/HC).
 - b. From the FD/HC no more than one cross-connect shall be passed through to reach the CD/MC.
2. Splicing of copper cables shall be kept to a minimum.
3. Splicing of F/UTP and S/FTP copper cables is not permitted.

3.2 TYPICAL TDR BACKBONE

A. A typical TDR backbone for a hospital campus shall consist of:

1. Redundant (2 ea) 12 strand single-mode fiber each routed in a separate path
2. One 50 pair copper feed line

END OF SECTION

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SECTION 271500
HORIZONTAL CABLING

PART 1 - GENERAL

1.1 NOT USED

PART 2 - PRODUCTS

2.1 SUMMARY

- A. This section includes requirements and guidelines for the installation of F/UTP, ScTP, and Fiber horizontal cabling.
 - 1. Horizontal cable and its connecting hardware provide the means of transporting signal between the telecommunications outlet/connector and the horizontal cross-connect located in the communications termination room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.

PART 3 - EXECUTION

3.1 HORIZONTAL CABLE

- A. Quantity
 - 1. Two horizontal cables shall be routed to each work area. Cable connected to information outlets shall be CAT6A F/UTP, 4-pair, 100Ω balanced twisted-pair.
 - a. A work area is approximately 100 sq. ft., and includes the components that extend from the telecommunications outlet/connectors to the station equipment.
 - b. Two (2) standard cables shall be run to each wireless access point location per current best practice.
 - c. Three (3) standard horizontal cables shall be routed to each work area at IMG Reception Areas:
 - d. One (1) standard horizontal cable may be run to the following locations:
 - 1) IMG Exam Rooms: Three horizontal cables shall be routed to each exam room. Two for the charting system, and the other near the exam table for possible future attachment of medical equipment.
 - 2) Each building control system enclosure as directed by the building controls vendor.
 - 3) Spaces dedicated to the storage, charging, and up/down loading of data for a single unit of medical equipment shall only require one horizontal cable.
 - 4) Each IP Video Surveillance Camera at each of the designated locations.
 - 2. For voice or data applications, 4-pair balanced twisted-pair or fiber optic cables shall be run using a star topology from the telecommunications room serving that floor to every individual information outlet. The customer prior to installation of the cabling shall approve all cable routes.
 - 3. Installation interfaces shall be T568B wiring standards,
- B. Maximum Length

1. All horizontal cables, regardless of media type, shall not exceed 90 m (295 ft.) from the telecommunications outlets in the work area to the Floor Distributor/Horizontal Cross connect (FD/HC) located in the Telecommunication Room.
2. The combined length of jumpers, patch cords inclusive of equipment cables in the Floor Distributor/Horizontal Cross-connect shall not exceed 5m (16 ft.).
3. The maximum length of Work Area equipment cables shall be 5m (16 ft.) If a MuTOA (Multiple User Telecommunication Outlet) environment exists, then the maximum equipment cable shall not exceed 20m (66 ft.)(Lake Park Facility)
4. Terminate all conductors; no cable shall contain un-terminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels

C. Minimum Length

1. It is recommended that a minimum horizontal cable distance of 15m (49 ft.) shall be maintained between the telecommunications room and the work area. This will provide adequate Insertion Loss/Attenuation for applications over 1 Gig.
2. For installations with consolidation points, a minimum horizontal cable distance of 15m (49 ft.) shall be maintained between the telecommunications room and consolidation point, and 5m (16 ft.) between the consolidation point and the work area. This will provide adequate Insertion Loss/Attenuation for applications over 1 Gig.

D. Splice Free

1. Each run of balanced twisted-pair cable between Floor Distributor/Horizontal Cross-connect in the telecommunication room and the information outlet at the Work Area shall not contain splices.
2. Bridged taps and splices shall not be installed in the horizontal cabling

E. Protection

1. Horizontal distribution cables shall not be exposed in the work area or other locations with public access.
2. Horizontal distribution cables shall not be run in under slab raceways that are considered to be damp or wet locations unless suitably rated for the environment.
 - a. Under slab conduits are considered to be outside of the building are considered wet locations.

3.2 SEPARATION

A. Separation from EMI sources

1. Installation shall comply with BICSI TDMM and TIA/EIA-569-B for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and EMI Source shall be as follows:
 - a. EMI Source Rating Less Than 2 kVA: A minimum clearance of 5 inches.
 - b. EMI Source Rating between 2 and 5 kVA: A minimum clearance of 12 inches.
 - c. EMI Source Rating More Than 5 kVA: A minimum clearance of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or EMI Source shall be as follows:
 - a. EMI Source Rating Less Than 2 kVA: A minimum clearance of 2-1/2 inches.
 - b. EMI Source Rating between 2 and 5 kVA: A minimum clearance of 6 inches.
 - c. EMI Source Rating More Than 5 kVA: A minimum clearance of 12 inches.
4. Separation between communications cables in grounded metallic raceways and power lines and EMI Source located in grounded metallic conduits or enclosures shall be as follows:
 - a. EMI Source Rating Less Than 2 kVA: A minimum clearance of 2 inches.
 - b. EMI Source Rating between 2 and 5 kVA: A minimum clearance of 3 inches.

- c. EMI Source Rating More Than 5 kVA: A minimum clearance of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum clearance of 48 inches.
 - a. Separation between Communications Cables and Fluorescent Fixtures: A minimum clearance of 5 inches

B. Other Clearances

1. Horizontal pathways used for telecommunications cabling shall be dedicated for telecommunications use and not shared by other building services.
 - a. Note: For cables of different categories (ie: CAT5e, CAT6 & CAT6A UTP) running 10GBaseT applications it is necessary to separate those cables within the cable tray/raceway/wireway to protect against PSANEXT and PSANEXTFE coupling.
2. In a false ceiling environment, a minimum of 75 mm (3 in) shall be observed between the cable supports and the false ceiling.

3.3 PATHWAY

A. Materials

1. J-hooks are the minimum pathway device requirement by all low voltage contractors for use in open ceiling distribution. J-hooks shall not be spaced further than 5 ft. (1.5 m) apart with a recommendation of 3 ft. (1 m) spacing.
 - a. Note: Construction may require distances to exceed the maximum and are considered an exception requiring approval of the DCO Infrastructure Cabling Team.
 - b. J-hooks must be installed without exception; free flight of cables in ceiling space is not acceptable.
2. Continuous conduit runs installed by the contractor should not exceed 30.5 m (100 ft.) or contain more than two (2) 90 degree bends without utilizing appropriately sized pull boxes.
3. Cable Tie Wraps
 - a. Cable Tie Wraps are not permitted as a pathway device or support
 - b. Tie wraps shall only be used to provide strain relief at termination points.
 - c. Tie wraps shall not be over tightened to the point of deforming or crimping the cable sheath.

B. Constraints

1. All horizontal pathways shall be designed, installed and grounded to meet applicable local and national building and electrical codes and ordinances.
2. Horizontal cables shall be installed in "dry" locations that provide protection from moisture levels above the intended operating range of inside plant (ISP) cables. "Slab-on-Grade" building designs wherein pathways are installed underground on in the poured concrete slabs that are in direct contact with the soil are considered wet locations and hence are not permitted.
3. Horizontal pathways shall be installed or selected such that the minimum bend radius of horizontal cables is kept within manufacturer specifications both during and after installation.
4. A minimum of a 1" diameter conduit is recommended for new construction. Existing conduits will require the reduction of the number of cables placed in the conduit to meet the required fill ratio.
 - a. The Contractor shall observe the bending radius and pulling strength requirements of the 4 pair balanced twisted-pair and fiber optic cable during handling and installation.
 - 1) 4-Pair UTP, F/UTP, S/FTP bend radius = 4 times outside diameter of cable under no-load conditions. 8 times the outside diameter under load (pulling 110 N/25 lbf.) conditions.

- 2) Multi-pair or Hybrid cable bend radius = 10 times the outside diameter under all conditions.
- 3) 2-Fiber and 4 Fiber cables bend radius = 25mm (1 in.) under no-load conditions. 50mm (2 in.) under load (pulling 222 N 50 lbf)
5. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
6. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
7. Do not install bruised, kinked, scored, deformed, abraded cable or otherwise damaged cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. During Cold-Weather Installation, bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.

C. Capacity

1. The number of horizontal cables placed in a cable support or pathway shall be limited to a number of cables that will not alter the geometric shape of the cables.
2. Maximum pathway (cable tray/basket tray/wireway) capacity shall not exceed a calculated fill ratio of 50% to a maximum of 75 mm (3 in) inside depth.
3. Maximum conduit pathway capacity shall not exceed a 40% fill. However, perimeter and furniture fill is limited to 60% fill for move and changes. A 40% fill ratio is the maximum fill for CAT6A F/UTP cables.
4. All unused cables shall be removed
 - a. Or labeled at both ends designating future purpose and locations of each end.

END OF SECTION

SECTION 271513

COPPER CABLE

PART 1 - GENERAL

1.1 PALLETTE

- A. Color palette shall be in accordance with Section 270553

1.2 SUMMARY

- A. This Section covers approved F/UTP cable types
- B. Systems shall be CAT6A F/UTP unless a written deviation has been approved.
- C. CAT6A UTP and CAT6A F/UTP shall not be mixed on the same campus.
- D. This cable shall be used for both voice and data applications and shall be plenum rated where required by code
 - 1. Clinical systems (orange) and wireless (yellow) cables shall be plenum rated.
- E. Comply with ICEA S-90-661 for mechanical properties.
- F. Comply with TIA/EIA-568-B.1 for performance specifications.
- G. Comply with TIA/EIA-568-B.2, Category 6A. F/UTP

PART 2 - PRODUCT

2.1 APPROVED PRODUCT

- A. TYPE 6A F/UTP (foil over unshielded twisted pair) - Siemon
 - 1. Part #:
 - a. Refer to Appendix #8 for current approved part numbers
 - b. Siemon 9A6P4-A5-(XX)-R1A® 6A F/UTP Plenum 4-Pair Cable (CMP)
 - c. Siemon 9A6R4-A5-(XX)-R1A® 6A F/UTP Riser 4-Pair Cable (CMR)
 - 2. Specifications:
 - a. Be available in standard jacket colors per Section 270553.

2.2 ONLY BY ADVANCE APPROVED EXCEPTION (CASE-BY-CASE)

- A. Approved and signed Deviation form must be on-site and provided upon request.
- B. TYPE 5e UTP (unshielded twisted pair) Siemon

- C. Minor changes and or changes to existing plant TYPE 5e UTP (unshielded twisted pair) Siemon may request a grandfathered status by submitting and gaining approval using the deviation process.
 - 1. Use by written exception only when required by a specific application
 - 2. Authorization granted only by IS Operations per Deviation Process
 - 3. Part #:
 - a. Siemon 9C5P4-E2-(XX)-RXA 5e UTP Plenum 4-Pair Cable (CMP)
 - b. Siemon 9C5R4-E2-(XX)-RXA 5e UTP Riser 4-Pair Cable (CMR)

END OF SECTION

SECTION 27 1543

FACEPLATES AND CONNECTORS

PART 1 - GENERAL:

1.1 PALLETTE

- A. Shall be white in color, with jacks that match the cable color that feed them.
- B. Exception: Match face plate colors as specified in Division 26 if specifically called out in contract documents.

1.2 DEFINITION

- A. Work-Area Cabling
- B. The work area is comprised of work area outlet/connectors, faceplates, outlet boxes and equipment cords. It acts as the interface to the horizontal cabling from the horizontal cross-connect (HC) to telephone, network equipment, wireless access points (WAP) and VOIP devices.

1.3 SUMMARY

- A. This Section covers approved F/UTP cable types

PART 2 - PRODUCT:

2.1 APPROVED PRODUCT

A. OUTLETS

- 1. Part #:
 - a. Refer to Appendix #8 for current approved part numbers
 - b. Siemon F/UTP part #'s: Z6A-S(xx)
- 2. Performance
 - a. All 500 MHz CAT6A F/UTP information outlets designed for termination of 4-pair balanced twisted-pair CAT6A F/UTP copper cable must possess the following characteristics at the minimum:
 - 1) Exceed CAT6A F/UTP component compliance through the frequency range of 1 to 250 MHz with usable bandwidth to 500 MHz.
- 3. Features
 - a. Provide full integration of cable shielding through the termination process of the outlet.
 - b. Universal design allows the same outlet to be mounted in a flat or angled orientation.
 - c. Be backwards compatible to allow lower performing categories of cables or connecting hardware to operate to their full capacity.
 - d. Allow installation from the front or rear of the faceplate, and allow for the jack to pass through the faceplate without re-termination.
 - e. Have, as an option, an outlet, which can be mounted into an IEC 60603-7 compliant opening (keystone).

B. FACEPLATES

1. Part #:
 - a. Refer to Appendix #8 for current approved part numbers
 - b. Siemon part #'s: 10GMX Faceplates preferred. Three ports maximum per box.
 - 1) 10GMX-FPS-(02)-02 (2-port)
 - 2) MX-FP-S-03-02
 - a) Consult with Intermountain Healthcare for port count in (xx) field.
2. All faceplates installed, as part of this specification shall have these minimum features listed below:
 - a. Be applicable to both fiber and copper applications.
 - b. Allow module outlet/connectors to be removed from the front of the faceplate.
 - c. Allow module outlet/connector to pass through faceplates even after termination.
 - d. Have write on designation labels for circuit identification together with a clear plastic cover.
 - e. Have optional modular furniture adapters available.
 - f. Have surface mount boxes and standoff rings available for both single and double gang faceplates
 - g. Be manufactured using UV resistant, high impact thermoplastic to prevent color fading and provide additional durability.

PART 3 - EXECUTION

3.1 WORK AREA TERMINATION

- A. All balanced twisted-pair cables wired to the telecommunications outlet/connector, shall have 4-pairs terminated in eight-position modular outlets in the work area. All pairs shall be terminated.
- B. Outlet/connector back boxes shall be a minimum 4-11/16 square box (4-11/16" x 4-11/16" x 2 7/8") for new construction to accommodate the CAT6A connectors. Existing back boxes will require a faceplate stand-off and/or a faceplate that can accommodate a bezel to extend the CAT6A jack out to allow the installation of the CAT6A connectors.
- C. The telecommunications outlet/connector shall be securely mounted at planned locations.
- D. The height of the telecommunications faceplates shall be to applicable codes and regulations.

3.2 PHYSICAL STRESS

- A. The maximum cable bend radii and pulling tensions shall not exceed manufacturer's specifications.
 1. 4-Pair F/UTP, S/FTP bend radius = 4 times outside diameter of cable under no-load conditions. 8 times the outside diameter under load (pulling 110 N/25 lbf.) conditions.
- B. Multi-pair or Hybrid cable bend radius = 10 times the outside diameter under all conditions. Manufacturer pulling tensions shall be used.
 1. 2-Fiber and 4 Fiber cables bend radius = 25mm (1 in.) under no-load conditions. 50mm (2 in.) under load (pulling 222 N 50 lbf)

3.3 SLACK – SERVICE LOOP - ROUTING

- A. In the work area, a minimum of 300 mm (12 in) should be left for balanced twisted-pair cables, while 1 m (3 ft) be left for fiber cables.

- B. In telecommunications rooms a minimum of 3m (10 ft) of slack should be left for all cable types. This slack must be neatly managed on trays or other support types.

END OF SECTION

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SECTION 27 1619

PATCH CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This section is issued as a guide for patch cable installations in the Data Center, wiring closets (TDR) and user areas where patch cables are required for connectivity to IP and TDM phones, and IP data connectivity needs for Intermountain Healthcare. All patch cables will support voice, data, and imaging applications within the Intermountain Healthcare Enterprise.
- B. The integrity of the installed cabling plant must be insured by using matching and quality patch cables. All patch cables shall be included in the low voltage contract, and will be required to match or exceed the existing level of the installed structured cabling system.
- C. Factory Terminated patch cords are required. These use pneumatic termination tools ensuring consistent quality and are tested and guaranteed to be matched and tuned for performance within the specified category cabling channel.
- D. Patch cables in data rooms (TDR) shall not be less than CAT6A F/UTP stranded

PART 2 - PRODUCTS

2.1 APPROVED PRODUCT

- A. Part #:
 - 1. Simon F/UTP part #: ZM6A-S (XX)-(XX)
 - a. Color of cords are to match corresponding cable. Use 1st (xx) to Specify length. Use 2nd (xx) for color.
- B. Performance
 - 1. All Category 6A modular equipment cords shall conform to the following minimum performance standards:
 - a. Be factory assembled and 100% transmission tested with laboratory grade network analyzers for proper performance up to 500MHz.
 - b. Be augmented category 6 component compliant out to 250 MHz with operational bandwidth to 500 MHz.
- C. Features
 - 1. Be backwards compatible with lower performing categories
 - 2. Be equipped with modular 8-position plugs on both ends, wired straight through with standards compliant wiring.
 - 3. Have a boot that features an ultra slim design for high density applications and snag free operation.

PART 3 - EXECUTION

3.1 PALLETTE

A. Patch Cable Color Codes

1. The Intermountain Healthcare Enterprise standard for patch cable color is located in Section 270553.
2. The patch cable color shall match the feed cable color to identify the service provided.
3. Exception: Patch cables between devices at work stations optionally may be Black in color.

B. Patch Cord Labeling Requirements

1. Patch cords/Equipment cords shall be labeled the same as the Horizontal cable with a mechanically generated label within 300mm (12 in) of each end of the patch cord. Label configuration to be determined by Intermountain Healthcare.

C. Contractor furnished

1. The quantity of patch cords to be provided shall be specified in the plans.
 - a. If not included, count 1 for each data jack, 1 for each closet port, 1 for each telephone set

END OF SECTION

SECTION 27 4114

AUDIO SYSTEMS

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.
- B. Related Sections: The following division 27 sections contain requirements that relate to this section:
 - 1. Basic Communications Systems Materials and Methods
 - 2. Video Systems
 - 3. Control Systems
 - 4. Structured Cabling
 - 5. Sound Masking
- C. Related Sections: Several sections of division 26 contain requirements that relate to this section.

1.2 SUMMARY

- A. The audio system will provide for voice amplification and media device audio program amplification. Media device audio program and voice audio amplification will originate from various media sources and microphones, be switched through a source selection switcher, and/or be mixed, processed and amplified to the speaker system. In addition where specified, tele-conferencing is provided. All audio systems shall be in compliance with Intermountain Health Care standards and procedures.
- B. This Section includes requirements for audio system components including, but not limited to, the following:
 - 1. Microphones
 - 2. Mixers
 - 3. Power Amplifiers
 - 4. Cabinets
 - 5. Racks
 - 6. Speaker Systems
 - 7. Wiring
 - 8. Microphone Inputs
 - 9. Processors
 - 10. Combiners

1.3 SYSTEM DESCRIPTION

- A. General: The audio system shall be a complete system for amplifying sound signals from microphones and media source equipment and distributing them to loudspeakers at various locations.
- B. Functional Performance: Components and system features and functions shall include, but are not limited to, the following:
 - 1. Meet the following performance parameters as measured in 1/3 octave bands:

- a. From 100 Hz to 2kHz, flat within plus or minus 2dB.
- b. Above 2kHz, slope down along an approximate 3dB octave slope to 8kHz.
2. Sound pressure levels at 2kHz octave band shall not deviate more than plus or minus 2dB.
3. When driven to maximum output, clipping shall first occur in power amplifiers.
4. No noise, hum, RFI pickup or distortion shall be audible under normal operating conditions.
5. Sound system shall reproduce program material at a level of 90 dBA without audible distortion.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:
 1. Product data for each type of product specified.
 2. Shop drawings detailing audio system including, but not limited to the following:
 - a. Connection panels.
 - b. Rack elevations showing component arrangement inside equipment racks.
 3. Wiring Diagrams detailing wiring for power, signal, and control differentiating clearly between manufacturer-installed wiring and field-installed wiring. Identify terminal numbers and wiring color codes to facilitate installation, operation, and maintenance.
 4. Provide software layouts, programs, presets, routing, etc... for all audio processors and echo cancelors.
 5. Maintenance data for materials and products, for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 13 Section "Basic A/V System Requirements." Provide complete operations and maintenance manual material concurrently with system submittal and provide updated final versions of manuals one month before completion of construction and final system turnover. Include the following:
 - a. Equipment list showing quantity, make, model, and serial number.
 - b. System operating instructions.
 - c. System maintenance instructions.
 6. Wiring codes for all system cable. (See "labeling", this section).
 7. Proposed labeling for system components. (See "labeling", this section).
 8. All special submittal instructions indicated on supplied design drawings.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of sound system, components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firms with at least 5 years of successful installation experience of A/V system projects similar to that required for this project. In addition, installers must have successfully completed a minimum of 3 similar installations over a period of 2 years prior to the date of the bid opening for this project. System installations must have included similar automatic mixers, matrices, and echo cancellers hardware and software. To qualify as similar, audio systems must have included complete installation, set up, programming, balancing, and equalization of automatic mixers, matrix routers, echo cancellers, and digital audio processors. All such installation, set up, programming, balancing, and equalization work must have been completed by a factory trained and certified technician of the specified mixer, matrix, echo canceller, and digital audio processor manufacturer. The certified technician must have successfully completed all relevant training courses recommended by the manufacturers of the above referenced equipment for proficiency in these skill sets. In addition, the certified technician must have been, and now be, a direct employee of the installer, in a permanent office staffed with factory qualified technicians, working for a minimum of 40 hours per week as a

direct employee of the installer. The certified technician and factory trained installers must be the direct employees of the installer; sub-contracted, third party maintenance agreements, or similar arrangements are expressly prohibited, and do not qualify. Upon request, submit evidence of such qualifications to the A/V Consultant. All of the above requirements must be complied with prior to the bid opening for this project.

- C. Approved installer for this project is Marshall Industries.
- D. Electrical Component Standard: Provide work complying with applicable requirements of NFPA 70 "National Electrical Code."
- E. EIA Compliance: Comply with the following Technology Industries Association Standards:
 - 1. Sound Systems, EIA-160.
 - 2. Loudspeaker, Dynamic Magnetic Structures, and Impedance, EIA-299-A.
 - 3. Racks, Panels, and Associated Equipment, EIA-310-A.
 - 4. Amplifiers for Sound Equipment, SE-101-A.
 - 5. Speakers for Sound Equipment, SE-103.
 - 6. Microphones for Sound Equipment, SE-105.
- F. UL Compliance: Comply with requirements of UL 50.
- G. All installation practices shall be in accordance with, but not limited to, these specifications and drawings. Installation shall be performed in accordance with the applicable standards, requirements, and recommendations of the Uniform Building Code, the National Electrical Code and all local authorities having jurisdiction. All installation work shall follow "standard broadcast wiring" and installation practices, as excerpted from "Recommended Wiring Practices," Sound System Engineering, (2nd Edition), D. Davis, and performed to the highest standards of acknowledged industry practices.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in factory containers. Store in clean, dry space in original containers. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

1.7 WARRANTY REQUIREMENTS

- A. Audio system shall be subject to warranty requirements as stated in Division 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by those manufacturers identified in the equipment list. Firms regularly engaged in manufacture of sound system components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. All equipment and material shall be new, and must have been commercially available for at least one year prior to bid.
- C. All equipment must be UL listed or built to UL standards.

2.2 SYSTEM REQUIREMENTS

- A. General: Provide complete and fully functional audio systems using materials and equipment of types, sizes, ratings, and performances as indicated in the equipment list in the accompanying drawings. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction in accordance with published product information. Coordinate the features of materials and equipment so they form an integrated system with components and interconnections matched for optimum performance of specified functions.
- B. Provide all wire, cable, and connectors as required to complete the installation of all systems as designed and specified.

2.3 EQUIPMENT AND MATERIALS

- A. General: Provide equipment selected from equipment list on drawings, using all solid-state components fully rated for continuous duty at the ratings indicated or specified. Select equipment for normal operation on input power supplied at 105-130 V, 60 Hz.
- B. Provide equipment as indicated on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with the Installer present, for compliance with requirements and other conditions affecting the performance of the Audio System work.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.
- B. All equipment shall be firmly secured in place unless requirements of portability dictate otherwise. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three times the weight of the equipment being installed. Any structural mounting that is not able to meet this requirement due to the specific nature of the equipment, manufacturer's requirements or limitations of the facility, shall not be installed without prior approval of the Engineer. Install all boxes, equipment, hardware, and other materials plumb, level, and square.
- C. Install all technology equipment and support equipment in podium, and the other millwork in a neat and cosmetically dressed-out manner. All saw cuts, holes and recesses into laminates and woodwork shall be straight, all radius and circular cuts shall be consistent, and all uneven surfaces shall be corrected. This shall include the use of moldings, grommets, bushings, laminates, and wood products as required to dress out the installation of equipment. Assure that the installation of equipment and panels in the technology racks and podiums are completed by using matching screws, hardware and grommets.
- D. Speakers:
 - 1. Confirm polarity of speaker before installation and wire to maintain uniform polarity.
 - 2. Mount transformers with screws securely to speaker brackets or enclosures.

3. Neatly mount speaker grilles, panels, connector plates, control panels, etc., tight, plumb, and square unless indicated otherwise on drawings.
4. Provide brackets, screws, adapters, springs, rack mounting kits, etc., recommended by manufacturer for correct assembly and installation of speaker assemblies and technology components.
5. Make speaker cable connections with rosin core solder or wire nut or equivalent connections.
6. Loosely but completely fill speaker back boxes that do not have fiberglass installed with fiberglass.
7. Seal cone speakers to backbox so air will not pass from one side of speaker to another.
8. Securely mount theater style speaker systems to custom wall mount brackets as detailed in the supplied design drawings. Comply with applicable seismic codes and requirements.

E. Technology:

1. Assure sufficient ventilation for adequate cooling of equipment.
2. Mount amplifiers at top of equipment cabinet. Install vent rack panels in unused spaces. Install vent panels at top and bottom and above each power amplifier.
3. Securely fasten equipment plumb and square in place. Where equipment is installed in rack cabinets, utilize all fastening holes and cover open spaces with perforated panels.
4. Securely fasten relays and small components. Do not use sticky-back tape for fasteners.
5. Install balancing transformer on each unbalanced input or output that connects to device outside equipment cabinet, or that connects to balanced input or output within equipment cabinet.
6. Connect powered components to 120 VAC outlets on transient voltage surge suppressors. Do not connect to outlets on other components.
7. Leave sufficient service loops of uniform length on cables to allow operation of system with chassis outside cabinet.
8. All equipment shall be held firmly in place with proper types of mounting hardware as recommended and/or supplied by the manufacturer. All mounting hardware provided with equipment shall be used when practical. This shall include, but not be limited to, front and rear rack rails, angle brackets and rack mount kits. All equipment shall be installed so as to provide reasonable safety to the operator. The Lessor shall supply adequate ventilation for all enclosed equipment items which produce heat.

F. Cable, Wire, and Connectors:

1. All cable and wire shall be new and unspliced. Splicing of cables and conductors is expressly prohibited in any location other than the equipment racks. Splicing of audio and video cables will not be allowed in any location. Splicing of control conductors shall be accomplished via punch block or terminal strip connections only.
2. Additional cable length shall be provided at all connector locations. Duplex box, junction box, and floor box locations shall be installed with sufficient cable length behind cover plates to permit wiring maintenance and connector replacement in the future.
3. When cable runs utilize the vertical cable raceways located within walls, the acoustic integrity of the walls shall be maintained. All cables that pass through cover plates of junction boxes and raceways, through slab-to-slab walls, and through conduit lines shall be properly gasketed and sealed and all acoustic material shall be restored or replaced.
4. Separation between system cables and all other services shall be maximized to prevent and/or minimize the potential for electro-magnetic interference (EMI). Particular care shall be taken to ensure at least a 12" separation from electrical lines whenever feasible. At points where separation is unavoidable, distribution cables shall cross other services at right angles whenever practical to minimize EMI.
5. Cables shall be installed in a manner that shall ensure no signal cables are placed on top of any lighting fixtures, ceiling speakers, video projector lifts, projection screens, HVAC controls or sensing devices, fire safety and sprinkler system detection technology, or any other technology or mechanical equipment.

6. No cables shall be laid directly on top of T-bar grid ceiling tiles.
7. System cables shall be installed in a manner that will not block access to other equipment or services, across removable service panels and/or in any other manner to prohibit routine maintenance of HVAC systems, fire safety equipment and building mechanical control systems.
8. All exposed cable shall be dressed with heavy duty neoprene heat-shrink tubing.
9. All inter-rack cabling shall be neatly laced, dressed, strain relieved and adequately supported.
10. After completion of wiring and cable installation, all trough and box covers shall be notched out and grommited for clearance of the various cable bundles, (i.e., separate audio, video, and control). These panel covers shall be screwed back in place and all gaskets shall be restored or replaced.
11. Do not place any wires and cables for this system in any conduit, raceway, wireway or cable tray that is used for the mechanical systems of the building.
12. Provide connectors of the type and quality as detailed in this contract, and/or as required to meet the minimum bandwidth requirements of the equipment to which the connectors are terminated. The overall quantity of connectors shall not be limited by the quantities indicated in the drawings and shall be provided as required.
13. No connectors shall be installed in non-accessible locations or used for splicing cables. All connectors shall be new.
14. All connectors shall incorporate strain relief mechanisms which firmly grip the jacket of connected cables. All connectors shall be properly polarized to prevent improper seating. Connectors shall provide appropriate electrical characteristics for the circuitry to which they are attached.
15. All inner-rack cables shall be grouped according to the signals being carried to reduce signal contamination. Separate groups shall be formed for the following:
 - a. Power
 - b. Control
 - c. Video
 - d. Audio cables carrying signals less than -20 dBm.
 - e. Audio cables carrying signals between -20 dBm and +20 dBm.
 - f. Audio cables carrying signals over +20 dBm.
16. Route all cable and wiring within equipment racks, cabinets and millwork according to function, separating wires of different signal levels (microphone, line level, amplifier output, AC, control, etc.) by as much distance as possible. Neatly arrange, harness and bundle all cable with nylon U/V rated ties.
17. As a general practice, all power cables, control cables, and high level cables shall be run on the left side of equipment racks as viewed from the rear. All other cables shall be run on the right side of all equipment racks as viewed from the rear.
18. All cables, except video cables which must be cut to an electrical length, shall be cut to the length dictated by the cable run.
19. Terminal blocks, boards, strips or connectors, shall be furnished by the installer for all cables which interface with racks, cabinets, consoles, or equipment modules. Affix terminal blocks, boards, strips or connectors to equipment racks using screws only. Double sided tape will not be accepted.
20. Comply with industry standard circuit polarity and loudspeaker wiring polarity. No cables shall be terminated with a polarity reversal between connectors at either end.
21. All system wire, after being cut and stripped, shall have the wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. No bare wire ends shall be accepted.
22. Heat-shrink type tubing shall be used to insulate and dress the ends of all wire and cables including a separate tube for the ground or drain wire.
23. All solder connections shall be made with rosin-core solder. Temperature controlled soldering irons rated at least 60 watts shall be used for all soldering work. No soldering guns, gas or butane, or temperature unregulated irons shall be used on the job site.

24. The presence of such soldering tools on the job site shall constitute evidence of solder connections made with unauthorized tools and shall provide sufficient grounds for rejection of all solder connections in the system, and the subsequent re-work of same
25. All mechanical connections shall be made with approved crimp lugs of the correct size and type for the connection. Wire nuts shall not be permitted. Each connector shall be attached with the proper size controlled-duty-cycle ratcheting crimp tool which has been approved by the manufacturer of the connectors.
26. Conventional non-ratcheting type crimping tools are unacceptable, and shall not be used on the job site. The presence of such tools on the job site shall constitute evidence of mechanical connections made with unauthorized tools and shall provide sufficient grounds for rejection of all mechanical connections in the system, and the subsequent re-work of same.
27. Shields for audio cables shall be grounded at the input end only, of the various equipment items on the system to prevent potential for ground loops.

G. Identification and Labeling:

1. All cables, regardless of length, shall be marked with wrap-around number or letter cable markers at both ends. These labels shall be self laminating to ensure durability. The label format used shall be equal, or better than, the system detailed.
2. There shall be no unmarked cables any place in the system.
3. Marking codes used on cables shall correspond to codes provided with submittals, and/or the written documentation of the "as built" drawings.
4. All connectors, controls, equipment components, terminal blocks and equipment racks are to be permanently labeled in a format approved during the submittal process.
5. All equipment labels are to be permanently engraved in metal. Any alternative method shall be approved during the submittal process.
6. Clearly and permanently label all jacks, controls, connections, and so forth. Embossed or printed label tape shall not be used and is considered unacceptable for this system. Attach labels with double stick tape as required.
7. All labeling shall be completed prior to acceptance of the final system.

- H. Repairs: Wherever walls, ceilings, floors, or other building finishes are cut for installation, or accidentally marred during installation, repair, restore, and refinish to original appearance.

3.3 GROUNDING

- A. Provide equipment grounding connections for audio system as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
- B. Ground equipment, conductor, and cable shields to eliminate shock hazard and to eliminate ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
- C. Provide one #10 ground conductor with green insulation between all equipment racks and the main electrical panel ground bus. Connect at each end.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of a factory authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
- B. Pretesting: Upon completing installation of the system, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the conformance of the

system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new, and retest until materials satisfactory performance and conditions are achieved.

- C. Balance and Equalization: Perform the final balance and equalization. Comply with the equalization requirements stated above.
- D. A/V Consultant Final Review:
 - 1. Contractor shall assist A/V Consultant in performing the final review, and spot checking the balance and equalization.
 - 2. Coordinate final inspection schedule with A/V Consultant two weeks minimum prior to Consultant's final inspection.
 - 3. Have copy of red-lined as-built documents available at time of inspection.
 - 4. Have loose equipment (microphones, cables, etc) available at time of inspection.
 - 5. Assist Sound/Acoustic Consultant in final inspection of completed system.
 - 6. Provide the following test equipment in good working order:
 - a. Battery operated hand-held 1/3 octave real-time audio spectrum analyzer with SPL meter and precision microphone.
 - b. Digitally generated random pick noise generator, 20Hz-20kHz, minimum 2 hr repetition rate.
 - c. Direct reading audio impedance meter, minimum 3 frequencies, 10% accuracy.
 - d. Digital Volt-Ohmmeter.
 - e. Audio oscillator, variable frequency, 20Hz-20kHz.
 - f. Battery operated oscilloscope, 1 MHz minimum bandwidth.
 - g. Necessary charger, cables, test leads, adapter, power strip, etc, for test equipment.
 - 7. Correct minor items so A/V Consultant may certify satisfactory completion during his visit.
 - 8. Pay Consultant's additional fees and expenses if building or system have not been completed properly or sufficiently, requiring A/V Consultant to make subsequent visits to balance, equalize, inspect, or certify completion.

3.5 COMMISSIONING

- A. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. Provide a minimum of six hours training.
- B. Schedule training with Owner through the Architect, with at least 7 days advance notice.
- C. Occupancy Adjustments: When requested by the Owner or the A/V Consultant within one year of date of substantial completion, provide on-site assistance in adjusting sound levels, resetting matching transformer taps, and adjusting controls to suit actual occupied conditions. Provide up to three visits to the site for this purpose at no additional cost to the owner.

3.6 CLEANING AND PROTECTION

- A. Prior to final acceptance, clean system components and protect from damage and deterioration.

END OF SECTION 274114

SECTION 27 4115

VIDEO SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to this Section.
- B. Related Sections: The following division 27 sections contain requirements that relate to this section:
 - 1. Basic Communications Systems Materials and Methods
 - 2. Audio Systems
 - 3. Control Systems
 - 4. Structured Cabling
- C. Related Sections: Several sections of Division 26 contain requirements that relate to this section.

1.2 SUMMARY

- A. The video system will provide for large screen viewing of multiple media sources. Video and data signals will originate in media devices, be processed, selected and displayed. In addition, where specified, video conferencing is provided. All video systems shall be in compliance with Intermountain Health Care standards and procedures.
- B. This Section includes requirements for video system components including, but not limited to, the following:
 - 1. Video/data Projectors
 - 2. Front Projection Screens
 - 3. Digital Signage.
 - 4. Distribution Switchers
 - 5. Matrix Switchers
 - 6. Video Conferencing CODECs
 - 7. Cameras
 - 8. Computer Interfaces
 - 9. Various Media Source Devices
 - 10. Monitors
 - 11. Video Distribution Systems
 - 12. Racks
 - 13. Wire, Cable, and Connectors

1.3 SYSTEM DESCRIPTION

- A. General: The video system shall be a complete system for the large screen projection and monitoring of video, data, and graphics signals.
- B. Video/Data Functional Performance: Components and system features and functions shall include, but not be limited to:
 - 1. Processing, routing and display of any video, data, or graphic signal up to and including native resolutions of at least 1920 by 1080.
 - 2. Large screen projection systems.

3. Large flat screen monitors
4. Video conferencing.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
- C. Shop drawings detailing video system including, but not limited to the following:
 - a. Connection panels.
 - b. Rack elevations showing component arrangement inside equipment racks.
 - c. Shop drawings which identify proposed projector lift and electric roll up screen mounting details.
2. Wiring Diagrams detailing wiring for power, signal, and control differentiating clearly between manufacturer-installed wiring and field-installed wiring. Identify terminal numbers and wiring color codes to facilitate installation, operation, and maintenance.
3. Maintenance data for materials and products, for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 27 Section "Basic Technology Systems Requirements." Provide complete operations and maintenance manual material concurrently with system submittal and provide updated final versions of manuals one month before completion of construction and final system turnover. Include the following:
 - a. Equipment list showing quantity, make, model, and serial number.
 - b. System operating instructions.
 - c. System maintenance instructions.
4. Wiring codes for all system cable. (See "labeling", this section).
5. Proposed labeling for system components. (See "labeling", this section).
6. All special submittal instructions indicated on supplied design drawings.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of video system, components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firms with at least 5 years of successful installation experience of A/V system projects similar to that required for this project. In addition, installers must have successfully completed a minimum of 3 similar installations over a period of 2 years prior to the date of the bid opening for this project. System installations must have included similar switchers, matrices, scalars, processors, CODECS, and projectors. To qualify as similar, video systems must have included complete installation, set up, programming, calibration, and equalization of switchers, matrix routers, scalars, processors, CODECS, and projectors. All such installation, set up, programming, calibration, and equalization work must have been completed by a factory trained and certified technician of the specified switchers, matrix routers, scalars, processors, CODECS, and projectors manufacturer. The certified technician must have successfully completed all relevant training courses recommended by the manufacturers of the above referenced equipment for proficiency in these skill sets. In addition, the certified technician must have been, and now be, a direct employee of the installer, in a permanent office staffed with factory qualified technicians, working for a minimum of 40 hours per week as a direct employee of the installer. The certified technician and factory trained installers must be the direct employees of the installer; sub-contracted, third party maintenance agreements, or similar arrangements are expressly prohibited, and do not qualify. Upon request, submit evidence of such qualifications to the A/V Consultant. All of the above requirements must be complied with prior to the bid opening for this project.

- C. Approved installer for this project is Marshall Industries.
- D. Electrical Component Standard: Provide work complying with applicable requirements of NFPA 70 "National Electrical Code."
- E. EIA Compliance: Comply with the following Technology Industries Association Standards.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in factory containers. Store in clean, dry space in original containers. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

1.7 WARRANTY REQUIREMENTS

- A. Video system shall be subject to warranty requirements as stated in Division 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by those manufacturers identified in the equipment list.

2.2 SYSTEM REQUIREMENTS

- A. General: Provide a complete and fully functional video system using materials and equipment of types, sizes, ratings, and performances as indicated in the project drawings. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction in accordance with published product information. Coordinate the features of materials and equipment so they form an integrated system with components and interconnections matched for optimum performance of specified functions.
- B. Video Projection System: Provide complete projection system set up services including but not limited to convergence, focusing, preset programming, and alignment. Include manufacturer direct services and on site support.
 - 1. Set Up: Provide complete setup and convergence services as defined in the manufacturer's installation manual. Assure that all display devices automatically lock onto all owner designated horizontal scan frequencies and save to memory locations. Provide all equipment required to accomplish programming. At a minimum, without implying limitation, and in addition to those horizontal scan frequencies requested by the owner during the final system set up phase, program display systems to automatically lock onto horizontal scan frequencies for the following resolutions:
 - a. NTSC
 - b. CGA
 - c. VGA
 - d. EGA
 - e. SVGA
 - f. XGA
 - g. SXGA
 - h. UXGA
 - i. MAC II
 - j. MAC QUADRA
 - k. IBM workstations
 - l. UNIX workstations

- m. SUN workstations
 - n. DVI
 - o. HDMI
 - p. HD resolutions 1080i, 1080p, 720p
2. Mounting, Alignment, and Focusing: Provide all mounting brackets, threaded rod, unistrut, fasteners, and associated mounting hardware to securely affix the projector/lift to building structure. Suspend the projector/lift in compliance with industry recognized rigging procedures and in compliance with seismic codes. Coordinate exact mounting location with architect, mechanical and electrical. Align projector with the optical center of the screen and focus the video projector in relation to the image size, mounting systems, and video projection screen. All images shall be level, square, and aligned for optimum overall positioning with respect to the optical center line.
 3. All projected images shall be free of visible vibration and/or motion. Provide vibration isolation and dampening equipment where required.

2.3 EQUIPMENT AND MATERIALS

- A. General: Provide equipment selected from equipment list on drawings, using all solid-state components fully rated for continuous duty at the ratings indicated or specified. Select equipment for normal operation on input power supplied at 105-130 V, 60 Hz.
- B. Furnish and install adaptor cables and patch cables which comply with all requirements specified in the project notes.
- C. Provide equipment as indicated on drawings.
- D. All Electronic Displays are to be Energy Star compliant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with the Installer present, for compliance with requirements and other conditions affecting the performance of the video system work.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.
- B. All equipment shall be firmly secured in place unless requirements of portability dictate otherwise. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three times the weight of the equipment being installed. Any structural mounting that is not able to meet this requirement due to the specific nature of the equipment, manufacturer's requirements or limitations of the facility, shall not be installed without prior approval of the Architect. Install all boxes, equipment, hardware, and other materials plumb, level, and square.
- C. Install all technology equipment and support equipment in all podiums, and the other millwork in a neat and cosmetically dressed-out manner. All saw cuts, holes and recesses into laminates and woodwork shall be straight, all radius and circular cuts shall be consistent, and all uneven surfaces shall be corrected. This shall include the use of moldings, grommets, bushings, laminates, and wood products as required to dress out the installation of equipment. Assure

that the installation of equipment and panels in the technology racks and podiums are completed by using matching screws, hardware and grommets.

D. Electronics:

1. Assure sufficient ventilation for adequate cooling of equipment.
2. Install vent rack panels in unused spaces.
3. Securely fasten equipment plumb and square in place. Where equipment is installed in rack cabinets, utilize all fastening holes and cover open spaces with perforated panels.
4. Securely fasten relays and small components. Do not use sticky-back tape for fasteners.
5. Install balancing transformer on each unbalanced input or output that connects to device outside equipment cabinet, or that connects to balanced input or output within equipment cabinet.
6. Connect powered components to 120 VAC outlets on transient voltage surge suppressors. Do not connect to outlets on other components.
7. Leave sufficient service loops of uniform length on cables to allow operation of system with chassis outside cabinet.
8. All equipment shall be held firmly in place with proper types of mounting hardware as recommended and/or supplied by the manufacturer. All mounting hardware provided with equipment shall be used when practical. This shall include, but not be limited to, front and rear rack rails, angle brackets and rack mount kits. All equipment shall be installed so as to provide reasonable safety to the operator. The Lessor shall supply adequate ventilation for all enclosed equipment items which produce heat.

E. Cable, Wire, and Connectors:

1. All cable and wire shall be new and unspliced. Splicing of cables and conductors is expressly prohibited in any location other than the equipment racks. Splicing of audio and video cables will not be allowed in any location. Splicing of control conductors shall be accomplished via punch block or terminal strip connections only.
2. Additional cable length shall be provided at all connector locations. Duplex box, junction box, and floor box locations shall be installed with sufficient cable length behind cover plates to permit wiring maintenance and connector replacement in the future.
3. When cable runs utilize the vertical cable raceways located within walls, the acoustic integrity of the walls shall be maintained. All cables that pass through cover plates of junction boxes and raceways, through slab-to-slab walls, and through conduit lines shall be properly gasketed and sealed and all acoustic material shall be restored or replaced.
4. Separation between system cables and all other services shall be maximized to prevent and/or minimize the potential for electro-magnetic interference (EMI). Particular care shall be taken to ensure at least a 12" separation from electrical lines whenever feasible. At points where separation is unavoidable, distribution cables shall cross other services at right angles whenever practical to minimize EMI.
5. Cables shall be installed in a manner that shall ensure no signal cables are placed on top of any lighting fixtures, ceiling speakers, video projector lifts, projection screens, HVAC controls or sensing devices, fire safety and sprinkler system detection technology, or any other technology or mechanical equipment.
6. No cables shall be laid directly on top of T-bar grid ceiling tiles.
7. System cables shall be installed in a manner that will not block access to other equipment or services, across removable service panels and/or in any other manner to prohibit routine maintenance of HVAC systems, fire safety equipment and building mechanical control systems.
8. All exposed cable shall be dressed with heavy duty neoprene heat-shrink tubing.
9. All inter-rack cabling shall be neatly laced, dressed, strain relieved and adequately supported.
10. After completion of wiring and cable installation, all trough and box covers shall be notched out and grommeted for clearance of the various cable bundles, (i.e., separate audio, video, and control). These panel covers shall be screwed back in place and all gaskets shall be restored or replaced.

11. Do not place any wires and cables for this system in any conduit, raceway, wireway or cable tray that is used for the mechanical systems of the building.
12. Provide connectors of the type and quality as detailed in this contract, and/or as required to meet the minimum bandwidth requirements of the equipment to which the connectors are terminated. The overall quantity of connectors shall not be limited by the quantities indicated in the drawings and shall be provided as required.
13. No connectors shall be installed in non-accessible locations or used for splicing cables. All connectors shall be new.
14. All connectors shall incorporate strain relief mechanisms which firmly grip the jacket of connected cables. All connectors shall be properly polarized to prevent improper seating. Connectors shall provide appropriate electrical characteristics for the circuitry to which they are attached.
15. All inner-rack cables shall be grouped according to the signals being carried to reduce signal contamination. Separate groups shall be formed for the following:
 - a. Power
 - b. Control
 - c. Video
 - d. Audio cables carrying signals less than -20 dBm.
 - e. Audio cables carrying signals between -20 dBm and +20 dBm.
 - f. Audio cables carrying signals over +20 dBm.
16. Route all cable and wiring within equipment racks, cabinets and millwork according to function, separating wires of different signal levels (microphone, line level, amplifier output, AC, control, etc.) by as much distance as possible. Neatly arrange, harness and bundle all cable with nylon U/V rated ties.
17. As a general practice, all power cables, control cables, and high level cables shall be run on the left side of equipment racks as viewed from the rear. All other cables shall be run on the right side of all equipment racks as viewed from the rear.
18. All cables, except video cables which must be cut to an electrical length, shall be cut to the length dictated by the cable run.
19. Terminal blocks, boards, strips or connectors, shall be furnished by the installer for all cables which interface with racks, cabinets, consoles, or equipment modules. Affix terminal blocks, boards, strips or connectors to equipment racks using screws only. Double sided tape will not be accepted.
20. Comply with industry standard circuit polarity and loudspeaker wiring polarity. No cables shall be terminated with a polarity reversal between connectors at either end.
21. All system wire, after being cut and stripped, shall have the wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. No bare wire ends shall be accepted.
22. Heat-shrink type tubing shall be used to insulate and dress the ends of all wire and cables including a separate tube for the ground or drain wire.
23. All solder connections shall be made with rosin-core solder. Temperature controlled soldering irons rated at least 60 watts shall be used for all soldering work. No soldering guns, gas or butane, or temperature unregulated irons shall be used on the job site.
24. The presence of such soldering tools on the job site shall constitute evidence of solder connections made with unauthorized tools and shall provide sufficient grounds for rejection of all solder connections in the system, and the subsequent re-work of same.
25. All mechanical connections shall be made with approved crimp lugs of the correct size and type for the connection. Wire nuts shall not be permitted. Each connector shall be attached with the proper size controlled-duty-cycle ratcheting crimp tool which has been approved by the manufacturer of the connectors.
26. Conventional non-ratcheting type crimping tools are unacceptable, and shall not be used on the job site. The presence of such tools on the job site shall constitute evidence of mechanical connections made with unauthorized tools and shall provide sufficient grounds for rejection of all mechanical connections in the system, and the subsequent re-work of same.

27. Shields for audio cables shall be grounded at the input end only, of the various equipment items on the system to prevent potential for ground loops.

F. Identification and Labelling:

1. All cables, regardless of length, shall be marked with wrap-around, or better, number or letter cable markers at both ends. These labels shall be self laminating to ensure durability. The label format used shall be equal, or better than, the system detailed.
2. There shall be no unmarked cables any place in the system.
3. Marking codes used on cables shall correspond to codes provided with submittals, and/or the written documentation of the "as built" drawings.
4. All connectors, controls, equipment components, terminal blocks and equipment racks are to be permanently labeled in a format approved during the submittal process.
5. All equipment labels are to be permanently engraved in metal or plastic laminate and affixed with double-stick tape. Any alternative method shall be approved during the submittal process.
6. Clearly and permanently label all jacks, controls, connections, and so forth, with engraved laminated plastic labels. Embossed or printed label tape shall not be used and is considered unacceptable for this system. Attach labels with double stick tape as required.
7. All labeling shall be completed prior to acceptance of the final system.

G. Repairs: Wherever walls, ceilings, floors, or other building finishes are cut for installation , repair, restore, and refinish to original appearance.

3.3 GROUNDING

- A. Provide equipment grounding connections for satellite earth-station systems and components, including dish antenna and supporting structures, and lead-in wires to antenna-discharge units. Tighten connections in accordance with manufacturer's recommended tightening torques. If not manufacturer-specified, comply with tightening torques specified in UL Stds 486A and B to assure permanent and effective grounds.
- B. Provide equipment grounding connections for audio system as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
- C. Ground equipment, conductor, and cable shields to eliminate shock hazard and to eliminate ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
- D. Provide one #10 ground conductor with green insulation between all equipment racks and the main electrical panel ground bus. Connect at each end.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of a factory authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
- B. Pretesting: Upon completing installation of the system, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new, and retest until materials satisfactory performance and conditions are achieved.

- C. A/V Consultant Final Review & Equalization:
1. Contractor shall assist A/V Consultant in performing the final balance, equalization, and review.
 2. Coordinate final inspection schedule with A/V Consultant two weeks minimum prior to Consultant's final inspection.
 3. Have copy of red-lined as-built documents available at time of inspection.
 4. Have loose equipment (microphones, cables, etc) available at time of inspection.
 5. Assist Sound/Acoustic Consultant in final inspection of completed system.
 6. Provide the following test equipment in good working order:
 - a. Digitally generated test signal generator for all signals identified above.
 - b. Digital Volt-Ohmmeter.
 - c. Field strength meter.
 - d. Battery operated oscilloscope, 1 MHz minimum bandwidth.
 - e. Necessary charger, cables, test leads, adapter, power strip, etc, for test equipment.
 7. Correct minor items so A/V Consultant may certify satisfactory completion during his visit.
 8. Pay Consultant's additional fees and expenses if building or system have not been completed properly or sufficiently, requiring A/V Consultant to make subsequent visits to balance, equalize, inspect, or certify completion.

3.5 WARRANTY

- A. Provide warranty as indicated in Division 1. In addition all projectors dual listed on the drawings in equipment list with Hitachi shall comply with the Hitachi as indicated on the Hitachi USA website.

3.6 COMMISSIONING

- A. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. Provide a minimum of eight hours training.
- B. Schedule training with Owner through the Architect, with at least 7 days advance notice.
- C. Occupancy Adjustments: When requested by the Architect or the A/V Consultant within one year of date of substantial completion, provide complete auto convergence services, on-site assistance in adjustment of signal levels, and adjusting controls to suit actual occupied conditions. Provide up to six visits to the site for this purpose at no additional cost to the owner.

3.7 CLEANING AND PROTECTION

- A. Prior to final acceptance, clean system components and protect from damage and deterioration.

END OF SECTION 274115

SECTION 27 4116
CONTROL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to this Section.
- B. Related Sections: The following division 27 sections contain requirements that relate to this section:
 - 1. Basic Communications Systems Materials and Methods
 - 2. Audio Systems
 - 3. Video Systems
- C. Related Sections: Several sections of division 26 contain requirements that relate to this section.

1.2 SUMMARY

- A. All work specified in this section will be furnished and installed by the owner. It is included herein for purposes of coordination between trades under this contract, and the owner's designated installer.
- B. The control system will be a microprocessor based, modular card frame and card system, with control system intercommunication via a serial loop. Human interface will occur through color, programmable touch screen control panel(s), and/or miscellaneous control panels. The control system will control all room A/V functions and equipment, as well as dimmer packs for the room lighting system. The control system will interface to components via infra-red, serial, and contact closure control signals. The control system will include all hardware, firmware, software, and programming to provide complete system control functions including but not limited to all requirements specified in the programming outline included herein. Programming and touch panel layout shall comply with all Intermountain Health Care standards and layouts.
- C. This Section includes requirements for control system components including, but not limited to, the following:
 - 1. Touch Panels
 - 2. Control Panels
 - 3. Modular card frame systems
 - 4. Control cards
 - 5. Volume controllers
 - 6. General bus devices
 - 7. Racks
 - 8. Wire, Cable, and Connectors
- D. Related Sections: The following division 13 and division 16 sections contain requirements that relate to this section:
 - 1. Basic Technology Systems Materials and Methods
 - 2. Audio System

3. Video
4. Technology Systems Electrical

1.3 SYSTEM DESCRIPTION

- A. Comply with the Control System Programming Outline in developing the software programming for control system operations. The programming outline provides an in-depth narrative which describes the touch panel page design and specific button operating details. All general A/V systems functions will be associated with a specific color. For example, in the common button bar(s), each button will be a different color. When access is gained into control pages, the same color will be carried through to show related functions and controls. All touch panel buttons, graphics, and page configurations shall be developed and designed by the installer as required to produce a fully functioning system. All final page layouts shall be approved by the A/V Consultant and the Owners representative prior to final programming. This shall include all "help" pages, and all new pages and/or buttons which may not be described in the programming outline, but, nevertheless are required to provide a fully functional A/V control system. Submit proposed page layouts for approval in conjunction with the specified submittal process. The intent of the programming outline is not to eliminate the field engineering required of the contractor, but rather to give a clear course of logic desired for the touch panel buttons and pages.
- B. The control panels shall communicate with all specified A/V system components via the specified control system devices.
- C. Where applicable, the control system software will be written to include the video conference code as a single block of programming. All other A/V system code will be written as a separate block, and added to the code for video conferencing code. Provide sufficient "remark statements" to identify various blocks of code.
- D. The fluorescent and/or incandescent overhead lights in each room shall be controlled by the control system.
- E. The Installer shall provide the complete source code to the Owner for the completed functioning control system. In addition, the Installer must relinquish ownership of said software code, in writing, to the owner.
- F. The control system shall be an all digital touch panel system which permits easy operation of all room functions from a single unified panel. This shall include all "technician level" set-up parameters, default settings, presets, and other operational functions as described in this specification and/or required to accomplish fully functioning system.
- G. The control system shall include complete help functions as detailed in the Control System Programming Outline.
- H. The control system shall include operation of power controllers to energize the designated rack mounted system equipment per the Control System Programming requirements, and the system installation guidelines.
- I. The control system hardware shall be supplied by a manufacturer that offers factory-level training in advanced control operations and system programming. This training shall be available to enable the Owner's technical staff to acquire the technician-level skills needed to maintain the control system, and make programming modifications after the initial programming and installation of these system at the completion of the warranty period.

- J. The control system, and its associated equipment, shall interface and operate all equipment and devices, as detailed in the control system programming outline, and as illustrated in the supplied design drawings including, but not limited to lighting dimmers, video cassette recorder/players, Mixers, audio cassette players, compact disc players, document cameras, power controllers, volume controllers, satellite receivers, source selection switchers, signal scalers, video projectors, conferencing equipment, and any and all other system devices as required.
- K. The control system touch panel system shall include a "technician level" of operation separate from the "user level" of operation. This shall be provided to prevent unauthorized manipulation of set-up and control parameters, as detailed in the control system programming section, and as deemed appropriate by the owner. This shall include additional features as dictated by equipment and control operations.
- L. Installer shall provide "user level" hard copy basic steps of operation for each available level of source operation.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:
 - 1. Product data for each type of product specified.
 - 2. Shop drawings detailing control system including, but not limited to the following:
 - a. Document of proposed system programming logic tree, showing integrated control of all specified equipment, as well as the type of control signal planned for each type of equipment.
 - b. Provide to owner for view all touch panel pages from a internet based processor for review. Make available for a minimum of 2 weeks on at least 2 different occasions. Coordinate exact dates with owner/engineer prior to posting. Upon request provide a paper document of proposed touch panel programming showing scaled, color printout's of all touch panel pages which identify button colors, configurations, icons, graphics, and text.
 - c. Provide completed programs for all Extron IP link control systems and make available to the owner for review over the internet.
 - d. Rack elevations showing component configuration inside equipment racks.
 - e. Proposed modular control card for A/V or lighting system component to be controlled.
 - 3. Wiring Diagrams detailing wiring for power, signal, and control differentiating clearly between manufacturer-installed wiring and field-installed wiring. Identify terminal numbers and wiring color codes to facilitate installation, operation, and maintenance.
 - 4. Maintenance data for materials and products, for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 13 Section "Basic A/V System Requirements." Provide complete operations and maintenance manual material concurrently with system submittal and provide updated final versions of manuals one month before completion of construction and final system turnover. Include the following:
 - a. Equipment list showing quantity, make, model, and serial number.
 - b. System operating instructions.
 - c. System maintenance instructions.
 - 5. Wiring codes for all system cable. (See "labeling", this section).
 - 6. Proposed labeling for system components. (See "labeling", this section).
 - 7. All special submittal instructions indicated on supplied design drawings.

1.5 QUALITY ASSURANCE

- A. **Manufacturer's Qualifications:** Firms regularly engaged in manufacture of control system, components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. **Installer's Qualifications:** Firms with at least 5 years of successful installation experience of A/V system projects similar to that required for this project. In addition, installers must have successfully completed a minimum of 3 similar installations over a period of 2 years prior to the date of the bid opening for this project. System installations must have included similar control system hardware and software. To qualify as similar, control systems must have included touch panel(s), central processing unit(s), and custom programming for touch panel pages. All custom programming code writing must have been written and de-bugged by a factory trained and certified programmer of the specified control system manufacturer who has successfully completed all relevant training courses recommended by the control system manufacturer for proficiency in system programming. In addition, the certified programmer must have been, and now be, a direct employee of the installer, in a permanent office staffed with factory qualified technicians, working for a minimum of 40 hours per week as a direct employee of the installer. The certified programmer and factory trained installers must be the direct employees of the installer; sub-contracted, third party maintenance agreements, or similar arrangements are expressly prohibited, and do not qualify. Upon request, submit evidence of such qualifications to the A/V Consultant. All of the above requirements must be complied with prior to the bid opening for this project.
- C. Approved installer for this project is Marshall Industries.
- D. **Electrical Component Standard:** Provide work complying with applicable requirements of NFPA 70 "National Electrical Code."
- E. **Codes and Standards:** Comply with the following Codes and Standards:
 - 1. Racks, Panels, and Associated Equipment, EIA-310-A.
 - 2. NESC Compliance: Comply with National Electrical Safety Code requirements.
 - 3. FCC Compliance: Comply with Subpart J of PART 15, FCC Rules pertaining to computing devices including Class A, Class B, personal and peripheral types. Provide equipment which complies with technical standards for both radiated and power line conducted interference.
 - 4. UL Compliance: Comply with applicable requirements of UL Standards 486A and B, 813, 983, 1409, 1410, 1412, 1414, 1416, 1417, and 1418 pertaining to control system products. Provide control system and components which are UL-listed and labeled.
 - 5. All installation practices shall be in accordance with, but not limited to, these specifications and drawings. Installation shall be performed in accordance with the applicable standards, requirements, and recommendations of the Uniform Building Code, the National Electrical Code and all local authorities having jurisdiction. All installation work shall follow "standard broadcast wiring" and installation practices, as excerpted from "Recommended Wiring Practices," Sound System Engineering, (2nd Edition), D. Davis, and performed to the highest standards of acknowledged industry practices.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in factory containers. Store in clean, dry space in original containers. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

1.7 WARRANTY REQUIREMENTS

- A. Control system shall be subject to warranty requirements as stated in Division 1.

PRODUCTS

1.8 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by those manufacturers identified in the equipment list.

1.9 SYSTEM REQUIREMENTS

- A. General: Provide a complete and fully functional control system using materials and equipment of types, sizes, ratings, and performances as identified in the equipment list. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction in accordance with published product information. Coordinate the features of materials and equipment so they form an integrated system with components and interconnections matched for optimum performance of specified functions.
- B. The control system programming outline, as defined in these specifications, constitutes the minimum control system requirements for adequate control of the A/V and lighting systems. The programming outline is a guideline only, provided for the sole purpose of demonstrating intent. It is likely that touch panel/control system buttons, pages, and/or programming will be required which are not identified in the programming outline. During the final software programming, the installer shall work in a close and cooperative manner with the A/V consultant and owners representative, to make additional modifications, and/or changes in programming procedural events, changes in touch panel functions, and changes in programming features as needed at no additional cost to the owner. These adjustments to the system programming outline in this section shall include, but not be limited to, changes in the system programming code, page layouts, equipment operating modes, and system logic from the parameters outlined here to ensure the flexible and user friendly operation of the A/V system. Include all costs necessary to make moderate changes to the control system programming code and touch panel buttons and pages in the base bid.
- C. The final program shall have sufficient "remark statements" at various points in the program to enable easy identification of blocks of programming code.
- D. The Installer shall include a complete functioning code for the lighting system via control from both the touch panel pages as well as from the wall mounted lighting control panel as described.
- E. Upon completion of system installation, a complete set of backup source code programs for the touch panels and mainframe technology of each room shall be provided on 3 1/2" floppy disk or CD to the owner's representative.

1.10 EQUIPMENT AND MATERIALS

- A. General: Provide equipment selected from equipment list on drawings, using all solid-state components fully rated for continuous duty at the ratings indicated or specified. Select equipment for normal operation on input power supplied at 105-130 V, 60 Hz.
- B. Provide equipment as indicated on the drawings.

EXECUTION

1.11 EXAMINATION

- A. Examine conditions for compliance with requirements and other conditions affecting the performance of the control system work.
- B. Do not proceed until unsatisfactory conditions have been corrected.
- C. Verify compliance of following items before beginning control equipment installation.
 - 1. No cables spliced except at standard barrier terminal blocks or approved method inside equipment racks.
 - 2. Cables marked at each end with permanent wire labels such as Brady or equal.
 - 3. Specified conduit, cables, enclosures and equipment cabinets are properly installed.
 - 4. Location and angle of loudspeaker cabinets.
 - 5. Location and stability of projection system mounting supports.

1.12 INSTALLATION

- A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.
- B. System Programming and Programming Outline: Provide complete control system programming services including but not limited to the creation of custom software required to meet all contract document requirements including but not limited to the programming outline specified below. Include manufacturer direct services and on site support. Please note that not all equipment, functions, and/or controls may not be specified or required for all rooms. Program software based on the following programming outline as applicable to individual single line diagrams identified in the accompanying drawings.
 - 1. GENERAL PROGRAMMING REQUIREMENTS: The following programming outline contains control system programming requirements. In addition to these requirements, these specifications mandate the use of previously written code blocks, and system functionality descriptions prepared by the control system manufacturer. Installer shall comply with the design standards and touch panel layouts has provided by Rio Tinto. Where the programming outline conflicts with Rio Tinto standards Rio Tinto standards shall have precedence.
 - 2. SYSTEM ACTIVATION: When the A/V system has been deactivated by the system off button, or when the touch panel has entered its "time out" mode, display the following message on the touch screen: "TOUCH SCREEN TO ACTIVATE". This message will remain constantly on, and shift positions if recommended by the manufacturer to prevent burn in.
 - 3. INDIVIDUAL SYSTEM SHUTDOWN: Regardless of the time of day, the control system CPU in each individual classroom shall monitor system usage. If a control command has not been issued within a user adjustable period of time, a pop up window will ask "Do you want the A/V system to remain on?" with a "yes" button. If the yes button is engaged within 30 seconds, the system will remain on. If the yes button is not engaged within 30 seconds, a system off command will be issued, and the A/V system will proceed through orderly shut down. In addition, the control system in each classroom will automatically issue an off command each day at a user adjustable time of day.
 - 4. BUTTON HIGHLIGHTING: When any button is engaged on any touch panel control page, that button shall be highlighted for the duration of physical contact between the finger and

- touch screen. In addition, when a any system function is activated/selected, the button will remain highlighted to identify the active status of the control system. In addition, comply with additional button highlighting requirements stated in the programming outline.
5. **ICONS:** The programming outline is a written description of buttons, pages, and commands. Even though the buttons are described with words, it is required that the installer make a reasonable use of icons when programming the touch panel pages.
 6. **PAGE FLIPS AND POP UP WINDOWS:** Page flips and pop up windows are specified throughout the programming outline. If, at a specific location in the touch panel pages, the programmer believes one is more appropriate than the other, the programmer is encouraged to consult with the AV designer. Where pop up windows are used, program automatic time outs so that the pop up window will be automatically removed from the screen after a user adjustable period of time.
 7. **HELP BUTTONS:** Where specified, help buttons will be provided on touch panel pages. All help buttons will be a question mark within a diamond. Selecting will bring up a help screen for the page in question only. The installer shall provide and customize as required, clear, concise, brief text which helps the operator to understand the button choices and their actions on the applicable page. The language for these help page messages shall be approved by the A/V Consultant and the Owners representative prior to programming. A RETURN button shall be provided on the help page to bring the operator back to the page in question.
 8. **PODIUM TOUCH PANEL:** The specified touch panel will also serve as the video preview monitor for the rear wall mounted camera. The active portion of the touch panel used for monitoring purposes will be consistently located on all touch panel pages. All controls required for moving the monitor image, re-sizing the monitor image, minimizing (go partial screen) the monitor image, and maximizing (go full screen) the monitor image will be provided.
 9. **GREETING PAGE:** Upon first touching the screen a GREETING PAGE shall be displayed. This page will contain the OWNER'S LOGO, a welcome message, the DATE, the TIME, have the SYSTEM ON button, a HELP button (question mark within a diamond) and a LIGHTS button.
 - a. **BUTTON - SYSTEM ON:** Selecting brings a 10 key numeric pad to the display for password entry to operate the A/V system. The password entry page shall also be equipped with a return button, to return the user to the greeting page. The password shall not be more than four (4) digits. The password shall be user programmable, and accessible through the technician set up page. If entered correctly, bring up a START PAGE containing all common button bars. In addition, turn on the power controllers for all applicable A/V equipment with a 3 second delay between them. The last power controller circuit turned on shall be the audio amplifiers. In addition, all A/V applicable system parameters shall be set to default values. As an example only, without implying limitation, all volume levels shall be set to default values; the audio and video mutes shall be disengaged if previously left on; etc.... An incorrect password shall return the display back to the GREETING PAGE with no action taken.
 10. **COMMON BUTTON BARS:** With the exception of the greeting page, all control system touch panel pages will contain all "common button bars" for the purpose of allowing access to fundamental control functions from any location in the touch panel page/software program. When a button in the common button bar group is selected, that button shall become highlighted, and remain highlighted until interaction with the corresponding page is terminated. At a minimum, without implying limitation, the common button bars shall contain the following:
 - a. **COMMON BUTTON BAR 1, GENERAL, (top center):**
 - 1) **BUTTON - SOURCE SELECT:** Selecting brings up the source selection page.

- 2) BUTTON - CONFERENCING (if applicable): Selecting brings up the conferencing select page.
- 3) BUTTON - PROJECTOR/SCREEN: Selecting brings up the projector/screen control page.
- 4) BUTTON – CURRENT STATUS: Selecting displays the current status of the AV system. Items to be identified include, but are not limited to: Power to individual system components, projector standby, system muting, audio levels, lighting levels, input currently selected.
- 5) BUTTON - DISPLAY MODIFY (for rooms where multiple display devices serve a single physical space): Selecting brings up the display modify page.
- 6) BUTTON - WINDOW COVERINGS (if applicable): Selecting brings up the motorized window coverings control page.
- 7) BUTTON - SYSTEM OFF: Selecting shall display a text prompt asking "Are you sure?" with a text message stating that a certain period of time must elapse (time to be determined by the projector manufacturer) before the system can be powered on again; in addition, provide buttons YES, and NO. IF YES, the system shall power off the AC power controllers in reverse order of turn on, turning the audio amplifiers off first, followed, three (3) seconds later, by the rest of the designated A/V equipment. If NO, the system shall return the touch panel back to the previous page with no action taken.
- 8) BUTTON - HELP: Provide as specified above.
- 9) BUTTON - TECHNICIAN SET UP: (Hidden button, no border). Selecting brings a 10 key numeric pad to the display for password entry to technician set-up pages. The password shall not be more than four (4) digits. This password shall be user programmable, and accessible through a technician set up page. If entered correctly, operator will be allowed access to the technician set up pages.
- 10) DISPLAY - DATE: Will display the correct date.
- 11) DISPLAY - TIME: Will display the correct time of day.

b. COMMON BUTTON BAR 2, LIGHTING, (left):

- 1) BUTTON - FULL, (100%): Selecting shall cause selected room lighting to fade to programmed presets in 3 seconds.
- 2) BUTTON - MEETING: Selecting shall cause selected room lighting to fade to programmed presets in 3 seconds.
- 3) BUTTON - VIDEO CONFERENCE (for rooms with video conferencing only): Selecting shall cause selected room lighting to fade to programmed presets in 3 seconds.
- 4) BUTTON - PROJECTION: Selecting shall cause selected room lighting to fade to programmed presets in 3 seconds.
- 5) BUTTON - ROOM LIGHTS INCREASE: Selecting shall increase scene lighting levels. Minimum and maximum levels shall be programmed into the dimming system. Button shall operate incrementally and continuously. When selected incrementally, the room light levels shall increase incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the light levels shall increase continuously within the preprogrammed minimum and maximum parameters.
- 6) BUTTON - ROOM LIGHTS DECREASE: Selecting shall decrease scene lighting levels. Minimum and maximum levels shall be programmed into the dimming system. Button shall operate incrementally and continuously. When selected incrementally, the room light levels shall decrease incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the light levels shall decrease continuously within the preprogrammed minimum and maximum parameters.

- 7) BUTTON - OFF: Selecting shall cause selected room lighting to fade to off in 3 seconds.
 - 8) BUTTON - HELP: Provide as specified above.
- c. COMMON BUTTON BAR, MISCELLANEOUS (bottom left):
- 1) BUTTON - BACK: Selecting shall return the user to the previous page selected, similar to a common web browser. This function shall be provided on every touch panel page except for the GREETING PAGE and START PAGE.
- d. COMMON BUTTON BAR 3, VOLUME CONTROL, (right):
- 1) BUTTON - MICROPHONE VOLUME UP: Selecting shall simultaneously increase the input levels of all microphone inputs to the mixer. All mixer levels will change independently, without changing relative levels between microphone inputs. Minimum and maximum levels shall be programmed into the volume control which shall prevent complete inaudibility and/or feedback. Button shall operate incrementally and continuously. When selected incrementally, the volume shall increase incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the volume shall increase continuously within the preprogrammed minimum and maximum parameters. If microphones were muted prior to selection, disengage the mute function, display the bar graph, and engage the volume up control.
 - 2) BUTTON - MICROPHONE VOLUME DOWN: Selecting shall simultaneously decrease the input levels of all microphone inputs to the mixer. All mixer levels will change independently, without changing relative levels between microphone inputs. Minimum and maximum levels shall be programmed into the volume control which shall prevent complete inaudibility and/or feedback. Button shall operate incrementally and continuously. When selected incrementally, the volume shall decrease incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the volume shall decrease continuously within the preprogrammed minimum and maximum parameters. If microphones were muted prior to selection, disengage the mute function, display the bar graph, and engage the volume down control.
 - 3) DISPLAY - MICROPHONE VOLUME UP AND DOWN BAR GRAPH: Bar graph shall be continuously displayed adjacent to volume up and down buttons. Bar graph shall graphically display the window between the preprogrammed minimum and maximum volume settings. The bar graph shall be divided into a minimum of 10 segments which shall incrementally or continuously appear or disappear according to the volume button selected. The bar graph display shall be removed from the screen when the mute function is selected. The bar graph shall be restored to its previous setting when the mute function is toggled off.
 - 4) BUTTON - MICROPHONE MUTE (toggle function): Selecting shall highlight and flash the button, and simultaneously mute all microphone inputs to the mixer. Mute shall be defined as a minimum 60 dBA decrease in sound pressure level. Bar graph display shall be removed. Selecting again will simultaneously un-mute all microphone inputs to the mixer, and the bar graph display will be restored showing its previous setting.
 - 5) BUTTON - AUDIENCE MICROPHONE MUTE (toggle function) (where applicable): Selecting shall highlight and flash the button, and simultaneously mute all student microphone inputs to the mixer. Mute shall be defined as a minimum 60 dBA decrease in sound pressure level. Bar graph display shall be removed. Selecting again will simultaneously un-mute the student microphone

- inputs to the mixer, and the bar graph display will be restored showing its previous setting.
- 6) **BUTTON - MEDIA SOURCE VOLUME UP:** Selecting shall simultaneously increase the input levels of all media source inputs to the mixer. All mixer levels will change independently, without changing relative levels between microphone inputs. Minimum and maximum levels shall be programmed into the volume control which shall prevent complete inaudibility and/or feedback. Button shall operate incrementally and continuously. When selected incrementally, the volume shall increase incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the volume shall increase continuously within the preprogrammed minimum and maximum parameters. If the media source mixer inputs were muted prior to selection, disengage the mute function, display the bar graph, and engage the volume up control.
 - 7) **BUTTON - MEDIA SOURCE VOLUME DOWN:** Selecting shall simultaneously decrease the input levels of all media source inputs to the mixer. All mixer levels will change independently, without changing relative levels between microphone inputs. Minimum and maximum levels shall be programmed into the volume control which shall prevent complete inaudibility and/or feedback. Button shall operate incrementally and continuously. When selected incrementally, the volume shall decrease incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the volume shall decrease continuously within the preprogrammed minimum and maximum parameters. If the media source mixer inputs were muted prior to selection, disengage the mute function, display the bar graph, and engage the volume down control.
 - 8) **DISPLAY - MEDIA SOURCE VOLUME UP AND DOWN BAR GRAPH:** Bar graph shall be continuously displayed adjacent to volume up and down buttons. Bar graph shall graphically display the window between the preprogrammed minimum and maximum volume settings. The bar graph shall be divided into a minimum of 10 segments which shall incrementally or continuously appear or disappear according to the volume button selected. The bar graph display shall be removed from the screen when the mute function is selected. The bar graph shall be restored to its previous setting when the mute function is toggled off.
 - 9) **BUTTON - MEDIA SOURCE MUTE (Toggle function):** Selecting shall highlight and flash the button, and simultaneously mute the media source inputs to the mixer. Mute shall be defined as a minimum 60 dBA decrease in sound pressure level. Bar graph display shall be removed. Selecting again will simultaneously un-mute the media source inputs to the mixer, and the bar graph display will be restored showing its previous setting.
 - 10) **BUTTON - PLATFORM SPEAKERS VOLUME UP:** Selecting shall increase the level of the mixer output which feeds the platform speaker amplifier. Button shall operate incrementally and continuously. When selected incrementally, the volume shall increase incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the volume shall increase continuously within the preprogrammed minimum and maximum parameters. If the platform speakers were muted prior to selection, disengage the mute function, display the bar graph, and engage the volume up control.
 - 11) **BUTTON - FAR END AUDIO VOLUME UP (required where teleconferencing/video conferencing capability is specified):** Selecting shall increase the conferencing far end audio input to the mixer. Minimum and maximum levels shall be programmed into the volume control which shall prevent complete inaudibility and/or feedback. Button shall operate incrementally and continuously. When selected incrementally, the volume shall increase incrementally within the preprogrammed minimum and maximum

- parameters. When touched continuously, the volume shall increase continuously within the preprogrammed minimum and maximum parameters. If the far end audio was muted prior to selection, disengage the mute function, display the bar graph, and engage the volume up control.
- 12) **BUTTON - FAR END AUDIO VOLUME DOWN** (required where teleconferencing/video conferencing capability is specified). : Selecting shall decrease the conferencing far end audio input to the mixer. Minimum and maximum levels shall be programmed into the volume control which shall prevent complete inaudibility and/or feedback. Button shall operate incrementally and continuously. When selected incrementally, the volume shall decrease incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the volume shall decrease continuously within the preprogrammed minimum and maximum parameters. If the far end audio was muted prior to selection, disengage the mute function, display the bar graph, and engage the volume down control.
 - 13) **DISPLAY - FAR END AUDIO VOLUME UP AND DOWN BAR GRAPH:** Bar graph shall be continuously displayed adjacent to volume up and down buttons. Bar graph shall graphically display the window between the preprogrammed minimum and maximum volume settings. The bar graph shall be divided into a minimum of 10 segments which shall incrementally or continuously appear or disappear according to the volume button selected. The bar graph display shall be removed from the screen when the mute function is selected. The bar graph shall be restored to its previous setting when the mute function is toggled off.
 - 14) **BUTTON - MICROPHONE MUTE** (toggle function): Selecting shall highlight and flash the button, and mute far end audio input to the mixer. Mute shall be defined as a minimum 60 dBA decrease in sound pressure level. Bar graph display shall be removed. Selecting again will un-mute the far end audio input to the mixer, and the bar graph display will be restored showing its previous setting.
 - 15) **BUTTON - HELP:** Provide one help button for all audio volume and mute controls as specified above.
- e. **COMMON BUTTON BAR 5, MISCELLANEOUS, (bottom right):**
- 1) **BUTTON - PROJECTOR STANDBY** (toggle function): Selecting shall highlight and flash the button, stop the light output from the projector (video mute), and place the projector in standby. Selecting again shall "un-mute" the video projector light output and return the projector to normal operation. (Projector standby will not effect the podium monitor).
 - 2) **BUTTON - MAKE-A-POINT** (toggle function), (Icon: hammer and a head): Selecting shall highlight and flash the button, place the projector in standby, pause the transport motor on any source device in use, and fade lighting to the meeting preset. Selecting again will take the projector out of standby, disengage the transport motor pause of any source device in use, and fade lighting to the projection preset.
 - 3) **BUTTON - ANNOTATION:** Selecting will engage the annotation (Boeckeller Pointmaker) system capability. In addition, selecting will cause the monitor image to maximize, and will bring up an annotation system function control pop-up window.
 - 4) **BUTTON - HELP:** Provide as specified above.
- f. **INFRA-RED SENSORS** (if applicable): Infra-red sensors are specified to monitor the position of folding partition walls. Connect infra-red sensor signal outputs to control system voltage sensing cards:

- 1) **AUDIO SYSTEMS:** Upon sensing a closed partition, the audio matrix mixer will route audio signals to facilitate the use of fully functional, separate sound systems in all room sections simultaneously. The specified audio system will operate as completely separate, multiple systems including, but not limited to all automatic mixer functions, volume level change functions, and tele-conferencing functions fully operational in each room section. Upon sensing a closed partition, the audio matrix mixer will route audio signals to facilitate the use of a single, fully functional sound system in all combined room sections. The specified audio system will operate as a single system in all combined sections including, but not limited to all automatic mixer functions, volume level change functions, and tele-conferencing functions fully operational in each room section.
 - 2) **VIDEO SYSTEMS:** Upon sensing a closed partition, the RGBHV matrix switcher will route video signals to facilitate the use of fully functional, separate video systems in all room sections simultaneously. The specified video systems will operate as completely separate, multiple systems including, but not limited to source selection and display of video signals in various formats. Upon sensing an open partition, the RGBHV matrix switcher will route video signals to facilitate the use of a single, fully functional video system in all combined room sections. The specified video system will operate as a single system in all combined sections including, but not limited to source selection and display of video signals in various formats.
 - 3) **LIGHTING SYSTEMS:** Upon sensing a closed partition, the lighting systems will operate as fully functional, separate systems in all individual room sections simultaneously. The specified lighting systems will operate as completely separate, multiple systems including, but not limited to, preset changes, on/off commands, and dimmer level changes. Upon sensing an open partition, the lighting systems will operate as a single, fully functional, system in all combined room sections. The specified lighting system will operate as a single system including, but not limited to, preset changes, on/off commands, and dimmer level changes.
11. **SOURCE SELECTION PAGE:** (Use j-pegs of actual component photographs for source button icons).
- a. **BUTTON - DVD:** (if applicable) Selecting shall power up the applicable equipment (if not already on), set all applicable parameters to default values, route the stereo audio and video through the switching technology and audio reinforcement system to the appropriate display devices and to the audio amplification system. In rooms where multiple display devices serve a single physical space, the appropriate display devices will be selected utilizing a pop up graphic of the applicable room floor plan. The floor plan will show a button icon representing each display device at the appropriate location within the room graphic, and prompt: "PLEASE SELECT DESIRED DISPLAY DEVICES". As display devices are selected, buttons will become and remain highlighted. In addition, provide an ENTER button to implement display device selection commands to the switching technology. In addition, lower motorized projection screens and projector lifts to the show position, (if applicable). In addition, selecting will adjust lighting levels to the projection preset. In addition, selecting will close all motorized window coverings (if applicable). In addition, selecting will bring up the VCR function control page.
 - b. **BUTTON - COMPUTER INPUT (TYPICAL):** Selecting shall power up the applicable equipment (if not already on), route the stereo audio and analog RGB video through the switching technology and audio reinforcement system to the appropriate display devices and to the audio amplification system. In rooms where multiple display devices serve a single physical space, the appropriate display devices will be selected utilizing a pop up graphic of the applicable room floor plan. The floor plan will show a

button icon representing each display device at the appropriate location within the room graphic, and prompt: "PLEASE SELECT DESIRED DISPLAY DEVICES". As display devices are selected, buttons will become and remain highlighted. In addition, provide an ENTER button to implement display device selection commands to the switching technology. In addition, lower motorized projection screens and projector lifts to the show position, (if applicable). In addition, selecting will adjust lighting levels to the projection preset. In addition, selecting will close all motorized window coverings (if applicable). In addition, selecting will bring up the computer input function control page.

- c. **BUTTON - VIDEO INPUT (TYPICAL OF YC AND COMPOSITE WHERE APPLICABLE):** Selecting shall power up the applicable equipment (if not already on), route the stereo audio and video through the switching technology and audio reinforcement system to the appropriate display devices and to the audio amplification system. In rooms where multiple display devices serve a single physical space, the appropriate display devices will be selected utilizing a pop up graphic of the applicable room floor plan. The floor plan will show a button icon representing each display device at the appropriate location within the room graphic, and prompt: "PLEASE SELECT DESIRED DISPLAY DEVICES". As display devices are selected, buttons will become and remain highlighted. In addition, provide an ENTER button to implement display device selection commands to the switching technology. In addition, lower motorized projection screens and projector lifts to the show position, (if applicable). In addition, selecting will adjust lighting levels to the projection preset. In addition, selecting will close all motorized window coverings (if applicable). In addition, selecting will bring up the video input function control page.
- d. **BUTTON - HELP:** Provide as specified above.

12. **CONFERRING SELECT PAGE:**

- a. **BUTTON - VIDEO CONFERENCE (if applicable):** Selecting shall power up the applicable equipment (if not already on), set all applicable parameters to default values, route the CODEC audio and video through the through the switching technology and audio reinforcement system to the appropriate display devices and to the audio amplification system. The appropriate display devices will be selected utilizing a pop up graphic of the applicable room floor plan. The floor plan will show a button icon representing each display device at the appropriate location within the room graphic, and prompt: "PLEASE SELECT DESIRED DISPLAY DEVICES". As display devices are selected, buttons will become and remain highlighted. In addition, provide an ENTER button to implement display device selection commands to the switching technology. In addition, selecting will adjust lighting levels to the video conferencing preset. In addition, selecting will close all motorized window coverings (if applicable). In addition, selecting will bring up the video conferencing function control page.
- b. **BUTTON - TELE-CONFERENCE (if applicable):** Selecting shall power up the applicable equipment (if not already on), and set all applicable mixer and telephone interface parameters to default values. In addition, selecting will bring up the teleconference function control page.
- c. **BUTTON - HELP:** Provide as specified above.

13. **PROJECTOR/SCREEN CONTROL PAGE:**

- a. **BUTTON - PROJECTION ENVIRONMENT:** Selecting shall power on the projector(s), close window coverings (if applicable) and fade all lighting to the "projection" preset. In addition, cause a brief text message to be displayed recommending a 5 minute warm up time for quality display of computer data images. In addition, the projector shall reset to preprogrammed default settings.

- b. **BUTTON - MEETING ENVIRONMENT (typical):** Selecting shall display a text prompt asking "Are you sure, approximately (insert time recommended by the manufacturer) minutes must elapse prior to powering up the projector again?" with buttons YES, and NO. IF YES, the system shall power off the projector in accordance to the shut down procedure recommended by the manufacturer. In addition the projection screen shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. IF NO, the system shall return the touch panel back to the previous page with no action taken.
 - c. **BUTTON - PROJECTOR ON (typical):** Selecting shall power on the projector, and cause a brief text message to be displayed recommending a 10 minute warm up time for quality display of computer data images. In addition, the projector shall reset to preprogrammed default settings.
 - d. **BUTTON - PROJECTOR OFF (typical):** Selecting shall display a text prompt asking "Are you sure, approximately (insert time recommended by the manufacturer) minutes must elapse prior to powering up the projector again?" with buttons YES, and NO. IF YES, the system shall power off the projector in accordance to the shut down procedure recommended by the manufacturer. IF NO, the system shall return the touch panel back to the previous page with no action taken.
 - e. **BUTTON - PROJECTOR STANDBY (Toggle function) (typical):** Selecting shall highlight and flash the button, and place the video projector in stand by. Selecting again will take the projector out of stand by.
 - f. **BUTTON - PROJECTOR DEFAULT SETTINGS:** Selecting shall reset all the projector's applicable adjustments to a preprogrammed default settings (i.e. Brightness, contrast, color, hue, etc.)
 - g. **BUTTON - FRONT PROJECTION SCREEN LOWER (typical):** Selecting shall cause the projection screen to lower to its "show" position.
 - h. **BUTTON - FRONT PROJECTION SCREEN RAISE (typical):** Selecting shall cause the projection screen to raise to its "store" position.
 - i. **BUTTON - FRONT PROJECTION SCREEN STOP (typical):** Selecting shall cause the projection screen motion to stop.
 - j. **BUTTON - PROJECTOR LIFT, STORE POSITION (if applicable) (typical):** Selecting shall highlight button and raise projector lift into the finished ceiling for storage.
 - k. **BUTTON - PROJECTOR LIFT, SHOW POSITION (if applicable) (typical):** Selecting shall highlight button and lower projector lift to the show position.
 - l. **BUTTON - HELP:** Provide as specified above.
14. **DISPLAY MODIFY PAGE:** Provide a room graphic of the applicable room floor plan. The floor plan will show a button icon representing each display device at the appropriate location within the room graphic. In addition, include a HELP button as specified above. Selecting a button shall bring up a pop up window with the following buttons:
- a. **BUTTON - ON:** Turns the selected display device on (if not already on).
 - b. **BUTTON - OFF:** Turns the selected display device off (if not already off).
 - c. **BUTTON - STANDBY (For the projectors only) (Toggle function):** Selecting places the projector in standby. Selecting again takes the projector out of standby.
 - d. **BUTTON - CLEAR:** Clears all control commands issued to modify the source selection to the selected display device. Relinquish source selection control to the standard source selection specified above.
 - e. **BUTTONS - AVAILABLE SOURCES:** Provide one button icon for each available source device. Once a source device is selected, command the switching technology to route the selected source to the selected display device and remove the pop up window from the screen.
 - f. **BUTTON - HELP:** Provide as specified above.
15. **WINDOW COVERING CONTROL PAGE (IF APPLICABLE):**

- a. **BUTTON - WINDOW COVERINGS CLOSE:** Selecting shall cause all window coverings at the designated location to close.
- b. **BUTTON - WINDOW COVERINGS OPEN:** Selecting shall cause all window coverings at the designated location to open.
- c. **BUTTON - WINDOW COVERINGS STOP:** Selecting shall cause all window coverings at the designated location to stop.

16. **FUNCTION CONTROL PAGES:**

a. **DVD FUNCTION CONTROL PAGE (if applicable):**

- 1) **BUTTONS:** Provide all buttons necessary to control all functions of the selected device/system. As a general rule, without implying limitation, provide control buttons on touch panel function control pages which duplicate the control buttons provided on or in the device/system control panel, remote controller, and/or control software. Where sensible, configure and label buttons on touch panel function control pages in the same way system/device control buttons are configured and labeled on their own control panels, remote controllers, and/or control software.
- 2) **BUTTON - NEW SOURCE:** Selecting shall highlight button and discontinue all transport functions (if any) associated with the function control page. In addition, selecting shall bring up the SOURCE SELECT PAGE without turning off display devices (if applicable), systems and/or devices; raising the projection screen(s)/lift(s) (if applicable); opening window coverings (if applicable), or changing lighting levels (if applicable).
- 3) **BUTTON - EXIT:** Selecting shall highlight button and display a text prompt asking "Are you sure?" with buttons YES, and NO. If YES is selected, discontinue all transport functions (if any) associated with the function control page, and place the projector in standby (if applicable). In addition the projection screen(s)/lift(s) shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. In addition, selecting shall return the user to the START PAGE. If NO, the system shall return the touch panel back to the previous page with no action taken.
- 4) **BUTTON - HELP:** Provide as specified above.

b. **COMPUTER INPUT FUNCTION CONTROL PAGE (TYPICAL):**

- 1) **TEXT MESSAGE:** "You have selected computer input XX as an input source for display".
- 2) **BUTTON - NEW SOURCE:** Selecting shall highlight button and discontinue all transport functions (if any) associated with the function control page. In addition, selecting shall bring up the SOURCE SELECT PAGE without turning off display devices (if applicable), systems and/or devices; raising the projection screen(s)/lift(s) (if applicable); opening window coverings (if applicable), or changing lighting levels (if applicable).
- 3) **BUTTON - EXIT:** Selecting shall highlight button and display a text prompt asking "Are you sure?" with buttons YES, and NO. If YES is selected, discontinue all transport functions (if any) associated with the function control page, and place the projector in standby (if applicable). In addition the projection screen(s)/lift(s) shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. In addition, selecting shall return the user to the START PAGE. If NO, the system shall return the touch panel back to the previous page with no action taken.
- 4) **BUTTON - HELP:** Provide as specified above.

c. **VIDEO INPUT FUNCTION CONTROL PAGE (TYPICAL):**

- 1) TEXT MESSAGE: "You have selected XX video input as an input source for display".
- 2) BUTTON - NEW SOURCE: Selecting shall highlight button and discontinue all transport functions (if any) associated with the function control page. In addition, selecting shall bring up the SOURCE SELECT PAGE without turning off display devices (if applicable), systems and/or devices; raising the projection screen(s)/lift(s) (if applicable); opening window coverings (if applicable), or changing lighting levels (if applicable).
- 3) BUTTON - EXIT: Selecting shall highlight button and display a text prompt asking "Are you sure?" with buttons YES, and NO. If YES is selected, discontinue all transport functions (if any) associated with the function control page, and place the projector in standby (if applicable). In addition the projection screen(s)/lift(s) shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. In addition, selecting shall return the user to the START PAGE. If NO, the system shall return the touch panel back to the previous page with no action taken.
- 4) BUTTON - HELP: Provide as specified above.

d. TUNER FUNCTION CONTROL PAGE:

- 1) BUTTONS: Provide all buttons necessary to control all functions of the selected device/system. As a general rule, without implying limitation, provide control buttons on touch panel function control pages which duplicate the control buttons provided on or in the device/system control panel, remote controller, and/or control software. Where sensible, configure and label buttons on touch panel function control pages in the same way system/device control buttons are configured and labeled on their own control panels, remote controllers, and/or control software.
- 2) BUTTON - NEW SOURCE: Selecting shall highlight button and discontinue all transport functions (if any) associated with the function control page. In addition, selecting shall bring up the SOURCE SELECT PAGE without turning off display devices (if applicable), systems and/or devices; raising the projection screen(s)/lift(s) (if applicable); opening window coverings (if applicable), or changing lighting levels (if applicable).
- 3) BUTTON - EXIT: Selecting shall highlight button and display a text prompt asking "Are you sure?" with buttons YES, and NO. If YES is selected, discontinue all transport functions (if any) associated with the function control page, and place the projector in standby (if applicable). In addition the projection screen(s)/lift(s) shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. In addition, selecting shall return the user to the START PAGE. If NO, the system shall return the touch panel back to the previous page with no action taken.
- 4) BUTTON - HELP: Provide as specified above.

e. VIDEO CONFERENCE FUNCTION CONTROL PAGE:

- 1) BUTTONS: Provide all buttons necessary to control all functions of the selected device/system. As a general rule, without implying limitation, provide control buttons on touch panel function control pages which duplicate the control buttons provided on or in the device/system control panel, remote controller, and/or control software. Where sensible, configure and label buttons on touch panel function control pages in the same way system/device control buttons are configured and labeled on their own control panels, remote controllers, and/or control software.
- 2) BUTTON - NEW SOURCE: Selecting shall highlight button and discontinue all transport functions (if any) associated with the function control page. In

- addition, selecting shall bring up the SOURCE SELECT PAGE without turning off display devices (if applicable), systems and/or devices; raising the projection screen(s)/lift(s) (if applicable); opening window coverings (if applicable), or changing lighting levels (if applicable).
- 3) **BUTTON - EXIT:** Selecting shall highlight button and display a text prompt asking "Are you sure?" with buttons YES, and NO. If YES is selected, discontinue all transport functions (if any) associated with the function control page, and place the projector in standby (if applicable). In addition the projection screen(s)/lift(s) shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. In addition, selecting shall return the user to the START PAGE. If NO, the system shall return the touch panel back to the previous page with no action taken.
 - 4) **BUTTON - HELP:** Provide as specified above.

f. **TELE-CONFERENCE FUNCTION CONTROL PAGE, (TYPICAL):**

- 1) **BUTTONS:** Provide all buttons necessary to control all functions of the selected device/system. As a general rule, without implying limitation, provide control buttons on touch panel function control pages which duplicate the control buttons provided on or in the device/system control panel, remote controller, and/or control software. Where sensible, configure and label buttons on touch panel function control pages in the same way system/device control buttons are configured and labeled on their own control panels, remote controllers, and/or control software.
- 2) **BUTTON - NEW SOURCE:** Selecting shall highlight button and discontinue all transport functions (if any) associated with the function control page. In addition, selecting shall bring up the SOURCE SELECT PAGE without turning off display devices (if applicable), systems and/or devices; raising the projection screen(s)/lift(s) (if applicable); opening window coverings (if applicable), or changing lighting levels (if applicable).
- 3) **BUTTON - EXIT:** Selecting shall highlight button and display a text prompt asking "Are you sure?" with buttons YES, and NO. If YES is selected, discontinue all transport functions (if any) associated with the function control page, and place the projector in standby (if applicable). In addition the projection screen(s)/lift(s) shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. In addition, selecting shall return the user to the START PAGE. If NO, the system shall return the touch panel back to the previous page with no action taken.
- 4) **BUTTON - HELP:** Provide as specified above.

g. **VIDEO CAMERA FUNCTION CONTROL PAGE:**

- 1) **BUTTONS:** Provide all buttons necessary to control all functions of the selected device/system. As a general rule, without implying limitation, provide control buttons on touch panel function control pages which duplicate the control buttons provided on or in the device/system control panel, remote controller, and/or control software. Where sensible, configure and label buttons on touch panel function control pages in the same way system/device control buttons are configured and labeled on their own control panels, remote controllers, and/or control software.
- 2) **BUTTON - NEW SOURCE:** Selecting shall highlight button and discontinue all transport functions (if any) associated with the function control page. In addition, selecting shall bring up the SOURCE SELECT PAGE without turning off display devices (if applicable), systems and/or devices; raising the projection screen(s)/lift(s) (if applicable); opening window coverings (if applicable), or changing lighting levels (if applicable).

- 3) **BUTTON - EXIT:** Selecting shall highlight button and display a text prompt asking "Are you sure?" with buttons YES, and NO. If YES is selected, discontinue all transport functions (if any) associated with the function control page, and place the projector in standby (if applicable). In addition the projection screen(s)/lift(s) shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. In addition, selecting shall return the user to the START PAGE. If NO, the system shall return the touch panel back to the previous page with no action taken.
 - 4) **BUTTON - HELP:** Provide as specified above.
- h. **TECHNICIAN SET-UP PAGES:** NOTE: Unlike all other control system pages, the technician set up pages are described in general terms. The intent is to provide the installer flexibility in page creation and software programming.
- 1) **BUTTONS - PASSWORD PROGRAMMING:** Provide required buttons to program and save four digit password(s) for access to the specified pages. Password to be comprised of any combination of numbers and/or letters.
 - 2) **BUTTONS - DATE AND TIME SET:** Provide required buttons to set and enter the correct date, including day, month, and year. Provide required buttons to set and enter the correct time of day including hours and minutes.
 - 3) **BUTTONS - PROJECTOR LIFT (if applicable):** Provide required buttons to lower the projector lift to a "service" position.
 - 4) **BUTTON - HELP:** Provide as specified above.

END OF PROGRAMMING OUTLINE

- i. All equipment shall be firmly secured in place unless requirements of portability dictate otherwise. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three times the weight of the equipment being installed. Any structural mounting that is not able to meet this requirement due to the specific nature of the equipment, manufacturer's requirements or limitations of the facility, shall not be installed without prior approval of the A/V consultant. Install all boxes, equipment, hardware, and other materials plumb, level, and square.
- j. Install all technology equipment and support equipment in all podiums, and the other millwork in a neat and cosmetically dressed-out manner. All saw cuts, holes and recesses into laminates and woodwork shall be straight, all radius and circular cuts shall be consistent, and all uneven surfaces shall be corrected. This shall include the use of moldings, grommets, bushings, laminates, and wood products as required to dress out the installation of equipment. Assure that the installation of equipment and panels in the technology racks and podiums are completed by using matching screws, hardware and grommets.

C. Technology:

1. Assure sufficient ventilation for adequate cooling of equipment.
2. Install vent rack panels in unused spaces.
3. Securely fasten equipment plumb and square in place. Where equipment is installed in rack cabinets, utilize all fastening holes and cover open spaces with perforated panels.
4. Securely fasten relays and small components. Do not use sticky-back tape for fasteners.
5. Connect powered components to 120 VAC outlets on transient voltage surge suppressors. Do not connect to outlets on other components.
6. Leave sufficient service loops of uniform length on cables to allow operation of system with chassis outside cabinet.
7. All equipment shall be held firmly in place with proper types of mounting hardware as recommended and/or supplied by the manufacturer. All mounting hardware provided with equipment shall be used when practical. This shall include, but not be limited to, front and rear rack rails, angle brackets and rack mount kits. All equipment shall be installed so as to

provide reasonable safety to the operator. The Lessor shall supply adequate ventilation for all enclosed equipment items which produce heat.

D. Cable, Wire, and Connectors:

1. All cable and wire shall be new and unspliced. Splicing of cables and conductors is expressly prohibited in any location other than the equipment racks.
2. Additional cable length shall be provided at all connector locations. Duplex box, junction box, and floor box locations shall be installed with sufficient cable length behind cover plates to permit wiring maintenance and connector replacement in the future.
3. When cable runs utilize the vertical cable raceways located within walls, the acoustic integrity of the walls shall be maintained. All cables that pass through cover plates of junction boxes and raceways, through slab-to-slab walls, and through conduit lines shall be properly gasketed and sealed and all acoustic material shall be restored or replaced.
4. Separation between system cables and all other services shall be maximized to prevent and/or minimize the potential for electro-magnetic interference (EMI). Particular care shall be taken to ensure at least a 12" separation from electrical lines whenever feasible. At points where separation is unavoidable, distribution cables shall cross other services at right angles whenever practical to minimize EMI.
5. Cables shall be installed in a manner that shall ensure no signal cables are placed on top of any lighting fixtures, ceiling speakers, HVAC controls or sensing devices, fire safety and sprinkler system detection technology, or any other technology or mechanical equipment.
6. No cables shall be laid directly on top of T-bar grid ceiling tiles. Support cables installed outside of conduit at a maximum of four foot intervals from the building structure. Do not utilize support wires from other trades or systems.
7. System cables shall be installed in a manner that will not block access to other equipment or services, across removable service panels and/or in any other manner to prohibit routine maintenance of HVAC system, fire safety equipment and building mechanical control system.
8. All exposed cable shall be dressed with heavy duty neoprene heat-shrink tubing.
9. All inter-rack cabling shall be neatly laced, dressed, strain relieved and adequately supported.
10. After completion of wiring and cable installation, all trough and box covers shall be notched out and grommited for clearance of the various cable bundles, (i.e., separate audio, video, and control). These panel covers shall be screwed back in place and all gaskets shall be restored or replaced.
11. Do not place any wires and cables for this system in any conduit, raceway, wireway or cable tray that is used for the mechanical systems, electrical systems, or voice/data systems of the building.
12. Provide connectors of the type and quality as detailed in this contract, and/or as required to meet the minimum bandwidth requirements of the equipment to which the connectors are terminated. The overall quantity of connectors shall not be limited by the quantities indicated in the drawings and shall be provided as required.
13. No connectors shall be installed in non-accessible locations or used for splicing cables. All connectors shall be new.
14. All connectors shall incorporate strain relief mechanisms which firmly grip the jacket of connected cables. All connectors shall be properly polarized to prevent improper seating. Connectors shall provide appropriate electrical characteristics for the circuitry to which they are attached.
15. All inner-rack cables shall be grouped according to the signals being carried to reduce signal contamination. Separate groups shall be formed for the following:
 - a. Power
 - b. Control
 - c. Video
 - d. Audio cables carrying signals less than -20 dBm.

- e. Audio cables carrying signals between -20 dBm and +20 dBm.
 - f. Audio cables carrying signals over +20 dBm.
16. Route all cable and wiring within equipment racks, cabinets and millwork according to function, separating wires of different signal levels (microphone, line level, amplifier output, AC, control, etc.) by as much distance as possible. Neatly arrange, harness and bundle all cable with nylon U/V rated ties.
 17. As a general practice, all power cables, control cables, and high level cables shall be run on the left side of equipment racks as viewed from the rear. All other cables shall be run on the right side of all equipment racks as viewed from the rear.
 18. All cables, except video cables which must be cut to an electrical length, shall be cut to the length dictated by the cable run.
 19. Terminal blocks, boards, strips or connectors, shall be furnished by the installer for all cables which interface with racks, cabinets, consoles, or equipment modules. Affix terminal blocks, boards, strips or connectors to equipment racks using screws only. Double sided tape will not be accepted.
 20. Comply with industry standard circuit polarity and loudspeaker wiring polarity. No cables shall be terminated with a polarity reversal between connectors at either end.
 21. All system wire, after being cut and stripped, shall have the wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. No bare wire ends shall be accepted.
 22. Heat-shrink type tubing shall be used to insulate and dress the ends of all wire and cables including a separate tube for the ground or drain wire.
 23. All solder connections shall be made with rosin-core solder. Temperature controlled soldering irons rated at least 60 watts shall be used for all soldering work
 24. All mechanical connections shall be made with approved crimp lugs of the correct size and type for the connection. Wire nuts shall not be permitted. Each connector shall be attached with the proper size controlled-duty-cycle ratcheting crimp tool which has been approved by the manufacturer of the connectors.
 25. Conventional non-ratcheting type crimping tools are unacceptable, and shall not be used on the job site. The presence of such tools on the job site shall constitute evidence of mechanical connections made with unauthorized tools and shall provide sufficient grounds for rejection of all mechanical connections in the system, and the subsequent re-work of same.
 26. Shields for audio cables shall be grounded at the input end only, of the various equipment items on the system to prevent potential for ground loops.

E. Identification and Labelling:

1. All cables, regardless of length, shall be marked with wrap-around number or letter cable markers at both ends. These labels shall be self laminating to ensure durability. The label format used shall be equal, or better than, the system detailed.
2. There shall be no unmarked cables any place in the system.
3. Marking codes used on cables shall correspond to codes provided with submittals, and/or the written documentation of the "as built" drawings.
4. All connectors, controls, equipment components, terminal blocks and equipment racks are to be permanently labeled in a format approved during the submittal process.
5. Clearly and permanently label all jacks, controls, connections, etc... Embossed or printed label tape shall not be used and is considered unacceptable for this system.
6. All labeling shall be completed prior to acceptance of the final system.

- F. Repairs: Wherever walls, ceilings, floors, or other building finishes are cut for installation , repair, restore, and refinish to original appearance.

1.13 GROUNDING

- A. Provide equipment grounding connections for audio system as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
- B. Ground equipment, conductor, and cable shields to eliminate shock hazard and to eliminate ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
- C. Provide one #10 ground conductor with green insulation between all equipment racks and the main electrical panel ground bus. Connect at each end.

1.14 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of a factory authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
- B. Pretesting: Upon completing installation of the system, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new, and retest until materials satisfactory performance and conditions are achieved.
- C. A/V Consultant Final Review:
 1. Contractor shall assist A/V Consultant in reviewing the final system set up.
 2. Coordinate final inspection schedule with A/V Consultant two weeks minimum prior to Consultant's final inspection.
 3. Have copy of red-lined as-built documents available at time of inspection.
 4. Have loose equipment (microphones, cables, etc) available at time of inspection.
 5. Provide the following test equipment in good working order:
 - a. Digital Volt-Ohmmeter.
 6. Correct minor items so A/V Consultant may certify satisfactory completion during his visit.
 7. Pay Consultant's additional fees and expenses if building or system have not been completed properly or sufficiently, requiring A/V Consultant to make subsequent visits to inspect, or certify completion.

1.15 COMMISSIONING

- A. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. Comply with the requirements identified in section 13130, project closeout.
- B. Train Owner's A/V system users in the procedures for control system operation and related media device operation. Provide a minimum of four hours training on two non-consecutive days.
- C. Schedule training with Owner through the Architect, with at least 7 days advance notice.
- D. Occupancy Adjustments: When requested by the Architect or the A/V Consultant within one year of date of substantial completion, provide on-site assistance in controls to suit actual occupied conditions, including but not limited to minor programming changes, and touch panel page

reconfiguration. Provide up to eight visits to the site for this purpose at no additional cost to the owner.

1.16 CLEANING AND PROTECTION

- A. Prior to final acceptance, clean system components and protect from damage and deterioration.

END OF SECTION 274116

SECTION 27 5119

SOUND MASKING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes electronic noise generators, amplifiers, wiring, loudspeakers, controls, and auxiliary components to generate, amplify, distribute, and reproduce digitally synthesized and stabilized pink background noise to improve speech privacy in zones of coverage.

1.3 DEFINITIONS

- A. Test and Calibration Conditions: Spaces completely furnished but unoccupied, lights and HVAC systems on, HVAC system testing and balancing completed, ceiling components in place.
- B. Covered Spaces: Spaces above which masking speakers are installed.
- C. Pink Noise: Random noise signal with equal energy in each octave.
- D. Sound Masking: Covering up of one sound by another.

1.4 SYSTEM DESCRIPTION

- A. Zones: Single-zone coverage.
- B. Zones: Multiple-zone coverage.
- C. Channels: Single channel of masking sound to each zone.
- D. Channels: Separate channel of masking sound to each of two groups of speakers in each zone.
- E. Channels: Separate channel of masking sound to each of three groups of speakers in each zone.
- F. Signal Levels: Individually adjustable for each of 14 one-third octave bands centered at 200 through 4000 Hz, for sound-masking noise channels.
- G. Sound-Power Level Produced by System: Match NC 40 contour between 400 and 2000 Hz, with smooth roll-off above and below those frequencies.
 - 1. Initial Level: 40 dB, A-weighted.
 - 2. Final Adjusted Level: 40 to 50 dB, A-weighted. Determine final level for each space individually by measurement as specified in Part 3.

- 3. Measurements: Made under calibration conditions.
- H. Maximum Local Variance of Sound-Power Level: 6 dB for the 500-Hz octave band and 3 dB for the 1000-, 2000-, and 4000-Hz octave bands for 75 percent of the locations in covered spaces.
- I. Maximum Average Range of Sound-Power-Level Deviation: 2 dB in the 250-, 2000-, and 4000-Hz octave bands and 1.5 dB for the 500- and 1000-Hz octave bands for all locations.
- J. Directional Effect: People in covered spaces under calibration conditions cannot determine source of masking sound.
- K. Uniformity with Respect to Time: One-minute time-averaged sound-pressure level of any octave band of masking sound from 250 to 8000 Hz remains constant in any space to within a standard deviation of 2 dB when measured over a 30-minute period.
- L. Sound Quality: No audible hum or noise from this system in covered spaces when noise generators are off and power amplifiers are on with input volume controls set at 50 percent.

1.5 SUBMITTALS

- A. Product Data: For each component. Include nationally recognized testing laboratory listing data.
- B. Shop Drawings: Dimensioned plans and elevations showing minimum clearances and installed features and devices for system components. Show types and locations of masking speakers and their wiring connections, channel assignments, and axis orientations. Show ducts, beams, and other significant sound-reflecting and -absorbing elements in ceiling space and show locations of partitions below ceiling. Include a diagram showing interconnection of major system components for each zone and channel and indicating grounding connections.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Product Certificates: For sound-masking equipment and components, signed by product manufacturer.
- D. Qualification Data: For Installer.
- E. Record of Final Field Tests and Measurements: Include final tuned tap and control adjustment settings of system.
- F. Operation and Maintenance Data: For sound-masking equipment and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include data for each type of product, including all features and operating sequences, both automatic and manual.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer of sound-masking equipment. Refer to Division 01 Section "References" for definition of an experienced installer.
 - 1. The installer for this section to be the same installer for section 274114

- B. **Manufacturer Qualifications:** A prime system manufacturer who maintains or sponsors a service center capable of providing training, parts, and emergency maintenance and repairs at Project site with a 24 -hour maximum response time.
- C. **Testing Agency Qualifications:** An independent agency, with the experience and capability to conduct testing of sound-masking systems according to ASTM E 548. Required experience includes having tested a minimum of five different systems within the last five years, each system similar in size and complexity to Project system.
- D. **Source Limitations:** Obtain equipment components from a single source who assumes responsibility for compatibility of items used.
- E. **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.
- F. Comply with NFPA 70.
- G. Comply with UL 813, unless a more stringent standard is specified in Part 2.

1.7 COORDINATION

- A. Coordinate quantity and arrangement of speaker assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.

1.8 EXTRA MATERIALS

- A. Furnish extra products described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. **Sound-Masking Speaker Assemblies:** One Insert number for each 10 of each type used, but no fewer than one.
 - 2. **Fuses:** One for each type used, but no fewer than one.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - 1. Atlas Sound LP.
 - 2. Dynasound

2.2 PRODUCTS AND EQUIPMENT

- A. **Components:** Modular plug-in, heavy-duty, industrial-grade integrated circuit devices.
- B. **AC Supply Voltage Tolerance:** 105 to 130 V with no degradation of system performance.
- C. **Protection from Power Line Surges:** Integral surge suppressors listed under UL 1449; complying with IEEE C62.41, Category B; and with the following features:
 - 1. **Suppression Level:** 300 V.

2. Maximum Response Time: 5 nanoseconds.
 3. Circuit: Multistage, using inductors and silicon-avalanche zener diodes or equivalent.
 4. Indicator Lamp: Neon or light-emitting diode located on control panel and arranged to extinguish on failure of protection.
 5. Fuses: Externally accessible.
- D. Component Housings: Suitable for mounting in standard 19-inch (480-mm) relay racks, with connections at rear and controls either on rear panel or protected by a screw-fastened security cover.

2.3 NOISE GENERATOR AND FILTER UNITS

- A. Pink Noise Generator: Output octave bands from 30 to 4000 Hz.
- B. Filters for One-Third Octave Bands: Adjustable from 10 dB of boost to 10 dB of cut at each center frequency.
- C. High-Pass Filter: Approximate range of cutoff adjustment is 37 to 400 Hz.
- D. Low-Pass Filter: Approximate range of cutoff adjustment is 3.4 to 20 kHz.
- E. High-Cut Filter: Approximate range of cutoff adjustment is 180 to 9000 Hz with slope varying to 12 dB per octave.

2.4 PROGRAMMABLE AUDIO-LEVEL CONTROL UNIT

- A. Automatic Sound-Power-Level Changes: Six system channel changes, four times per day, and capable of different time settings for each day of week.
- B. Level Changes: Programmable from front panel of unit, and automatically incremented over a period long enough for sound-level variations to be imperceptible to occupants of covered spaces.
- C. Program Memory: Nonvolatile for one year, minimum, without power. When re-energized after a power outage, control starts at zero level and automatically advances system sound level at same rate used for programmed level changes.

2.5 POWER AMPLIFIERS

- A. Power Amplifiers: Comply with EIA SE-101-A, and have the following minimum features:
 1. Mounting: Rack mounted.
 2. Output Regulation: Less than 2 dB from zero to full load.
 3. Total Harmonic Distortion: Less than 3 percent, at rated power output from 50 to 12,000 Hz.
 4. Signal-to-Noise Ratio: 60 dB or greater, at rated output.
 5. Frequency Response: Within plus or minus 2 dB from 50 to 12,000 Hz.

2.6 MASKING SPEAKER ASSEMBLIES

- A. Speakers: Comply with EIA SE-103; cone type, with the following minimum features:
 1. Minimum Axial Sensitivity: 45 dB.
 2. Frequency Response: Within plus or minus 3 dB from 50 to 15,000 Hz.

3. Size: **8 inches (200 mm)** with **1-inch (25-mm)** voice coil and minimum **5-oz. (142-g)** ceramic magnet, unless otherwise indicated.
 4. Dispersion Angle: 100 degrees.
 5. Rated Output Level: 10 W.
- B. Configuration: Dual **8-inch (200-mm)** and dual **5-inch (125-mm)** units mounted on metal baffles and arranged for optimum, multidirectional, angular sound distribution. Arrange units for suspension from the building structure above the ceiling.
- C. Matching Transformers: Comply with EIA-160, full-power rated with 4 standard taps, and a maximum insertion loss of 0.5 dB.
- D. Assemblies installed in air-handling spaces shall comply with NFPA 70 requirements for rate of heat-release and rate of smoke-release characteristics. Tests for these requirements shall be according to UL 2043.

2.7 WIRE

- A. Speaker Wire: Untinned, twisted-pair, solid-copper wire with PVC jacket; listed and labeled for environmental air plenums where cable is indicated in plenum spaces and is not indicated to be in raceway.

2.8 COMPONENT MOUNTING RACKS

- A. Configuration: Comply with EIA-310-D. Factory-fabricated units designed for interchangeable mounting, forced or convection air cooling, wiring connection, and enclosure of standard **19-inch (482-mm)** relay rack modules.
- B. Mounting Provisions: Equipped for freestanding floor mounting.
- C. Cabinet: Factory-finished steel with component mounting rails and prewired plug strips for component power connections. Full front and rear doors with continuous hinges, handles, and cylindrical keyed locks.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Speaker Assemblies: Suspend with chains from building structure above ceilings so bottom of assembly is **6 to 8 inches (150 to 200 mm)** above upper plane of finished ceiling material. Use eyebolts on speaker assemblies for attachment. Suspend independently of supports for components of other building systems.
- B. Speaker Connections: For two- or three-channel systems, connect speaker assemblies alternatively so masking sound is redundant throughout zones of coverage.
- C. Wiring Method: Install wiring in raceways, unless otherwise indicated. Conceal raceways, except in unfinished indoor spaces.
- D. Wiring Method: Install wiring in raceways, except in accessible indoor ceiling spaces and attics and in hollow gypsum board partitions, and unless otherwise indicated. Conceal raceways and wiring, except in unfinished spaces.

- E. Wiring Method: Cable. Conceal cable in accessible ceilings, walls, and floors where possible.
- F. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess. Provide and use lacing bars and distribution spools.
- G. Pulling Cable: Do not exceed manufacturer's recommended pulling tensions. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between normal termination points. Remove and discard cable where damaged during installation and replace it with new cable.
- H. Exposed Cable: Install parallel to building lines, follow surface contours, and support as recommended by manufacturer.
- I. Grounding: As recommended by manufacturers, unless more stringent requirements are indicated. Ground equipment and conductors to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments. Install 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
- J. Impedance Matching: For system components, including connecting cable, provide end-to-end level and impedance-matched signal paths. Use matching networks and balancing devices at connections where necessary to avoid mismatches.
- K. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.2 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Identification for Electrical Systems." Use color-coded conductors and apply wire and cable marking tape to designate wires and cables so media are identified in coordination with system wiring diagrams.
- B. Label speaker assemblies as to channel and zone.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing. Include the following:
 - 1. Operational Test: Start system to confirm proper operation. Remove malfunctioning units, replace with new units, and retest. Make initial sound-spectrum and -level adjustments for each zone.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.

4. Pretesting: Tune, align, and adjust system and pretest components, wiring, and functions to verify they comply with specified material, installation, and performance requirements. Correct deficiencies and retest until satisfactory performance and conditions are achieved.
 5. Masking Sound-Power-Level Adjustments: Adjust independently for each space to minimum level between 40 and 50 dB that will provide speech privacy between adjacent workstations while complying with other system requirements.
- D. Final Acceptance Testing: Provide a minimum of 10 days' notice of acceptance test performance schedule. Schedule tests after pretesting has been successfully completed.
1. Test Conditions: As defined in "Test and Calibration Conditions" Paragraph in Part 1 of this Section. Perform tests as specified below, as required by ASTM E 1041, and as required to verify performance specified in Part 2 "System Description" Article.
 2. Instrumentation: Use a professional-quality, sound-level meter with octave-band filters and documentation of recent calibration against recognized standards.
 3. Record test observations, readings, and corrective actions.
 4. System Tests: Include the following for each system zone:
 - a. Speaker Circuit Impedance Test: Measure impedance at 1 kHz with amplifier disconnected, using a professional impedance meter or bridge. Locate and correct faults denoted by abnormal readings.
 - b. Ambient Sound-Level Tests: With system off, measure ambient sound level in one-third octave bands. Also measure ambient sound level as a single, wide-band, A-weighted reading.
 - c. Amplifier Noise Test: Check for performance specified in "System Description" Article with masking noise generator off and amplifiers on.
 - d. System Noise Test: With masking noise signal on and amplifiers adjusted at a working level 10 dB above ambient sound level, check for hum, buzz, rattle, or other operating deficiencies.
 - e. Spatial Uniformity Test: Measure sound level at locations no greater than 15 feet (4.6 m) o.c. throughout covered spaces to determine compliance with specified performance level.
 - f. Frequency Response Adjustment and Test: Adjust one-third octave frequency bands and other unit filters to provide response. Coordinate with NC 40 contour defined below between 200 and 2000 Hz, with smooth natural roll-off from those frequencies.

BAND	RELATIVE SOUND-POWER LEVEL - dB	ENCLOSED OFFICES
200	Plus 4	Minus 2
250	Plus 3	Minus 2
315	Plus 2	Minus 2.5
400	Plus 1	Minus 3
500	0	Minus 4
630	Minus 1	Minus 5
800	Minus 2	Minus 6
1000	Minus 3	Minus 7
1250	Minus 4	Minus 8.5
1600	Minus 5	Minus 10
2000	Minus 6	Minus 12

5. Adjust level of masking sound for each space so one-third octave band centered at 500 Hz has final selected sound-power level for that space. Measure deviation from listed values in one-third octave bands from 400 to 2000 Hz. Measured values must not deviate from those listed by more than 4 dB for open plan areas and 8 dB for enclosed

offices. The total of individual band deviations in eight bands must not exceed 16 dB for open plan areas and 30 dB for enclosed offices.

6. Walk-through Test: People in covered spaces cannot discern speaker locations.
7. Temporal Stability Test: Check for uniformity of time by measuring sound level in each of 14 octave bands at one-minute intervals over a 30-minute test period. Deviations must not exceed limits specified in Part 2 "System Description" Article.

- E. Retest: Correct deficiencies identified by tests and observations and retest until meeting specified requirements.
- F. Recording Control Settings and System Adjustments: Record final control settings and programming, and final tap setting of speaker matching transformers. Record final sound-level measurements and observations.

3.4 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain services. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 275119

SECTION 27 6001

APPENDIX 01 – DEVIATION REQUEST PROCESS

PART 1 - GENERAL

1.1 DEFINITIONS

- A. Cable Plant Deviation
 - 1. A business need to not fully comply with the requirements of the “Division 27 – Communications and Structured Cabling Specification document”
- B. Cable Plant Deviation Request form.
 - 1. The document is available from the Facilities Planning team, the Data Center Ops team, or the Infrastructure Cabling team.
 - 2. Usage:
 - a. The deviation request form shall be used if there is a business need to not comply with the requirements of the “Division 27 – Communications and Structured Cabling Specification document”
 - b. The deviation request form should also be used to propose a change to that document. Always verify that you are using the current version of the Standard before requesting a modification.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them, including but not limited to the listing found in Section 270000.

PART 2 - PROCESS

2.1 STANDARDS MODIFICATION

- A. Check the box and explain why the standard should be modified.

2.2 ALTERNATE PRODUCT

- A. The deviation form must be completed, submitted through channels, and approved prior to any deviation from the specifications. This includes issuing change orders.

2.3 AUTHORIZED SIGNATURES

- A. Both the Standards Holder and the Operations Manager are required for a deviation to be valid.

2.4 DEVIATION REVIEW PROCESS STEPS

- A. First be sure that there is an actual need. Then be certain that your manager, supervisor, or project manager agrees with the requested deviation. Be sure to state this, or obtain their

signature on the deviation form. By doing so you are confirming that your supervisor or project manager has approved.

- B. The requestor will then complete sections 1, 2, and 3 of the deviation form.
 - 1. The requestor should then digitally sign in the designated location at the end of Section 3.
- C. Forward the saved copy of this form to the Standards Holder via email. If the word "Deviation" is the first word in the message subject line, we'll try to give it high priority.
 - 1. Mailto: wayne.welling@imail.org
 - 2. CC: to Jason.king2@imail.org
- D. The Standards Holder will then review and evaluate the request. The requestor should be prepared to provide plans, specifications, and competitive bids if requested. Any email threads or meeting discussions regarding the issue will be taken into consideration.
- E. The Standards Holder will then cast an Approve or Deny vote, and forward the request to the Operations Management for a decision.
- F. When the decision has been made by the Operations Manager, the Standards Holder will then notify the requestor by returning the completed and signed form via email.
- G. An approved deviation will have the final disposition button 'Approved', and be signed by at least 2 people. One will be from the Standards Holder, and the other from the Operations Director or above. Others signatures may be required for specific features and areas such as Safety, Security, Print, Medical group, etc.

PART 3 - EXECUTION

3.1 POST DECISION EXECUTION

- A. DENIED
 - 1. If the requester is not satisfied with the decision, they may file an appeal with the I.S. Operations AVP, who will then escalate the issue to the appropriate business leaders as needed. The decision from the appeal is final.
- B. APPROVED
 - 1. If a deviation is approved for contracted material, labor, or method; the facilities project manager will arrange for fulfillment or contract adjustment as needed via appropriate contract channels such as change orders.

END OF SECTION

SECTION 27 6002

APPENDIX 02 – DOCUMENT REFRESH PROCESS

PART 1 - GENERAL

1.1 NOT USED

PART 2 - PRODUCTS

2.1 APPROVED PRODUCT

- A. The purpose of this section is to help ensure a current standards document.
- B. The product delivered will be a current revision or version of the Cable Plant Standards Document.
- C. All changes must be approved by Enterprise Infrastructure Cabling team.

PART 3 - EXECUTION

3.1 REVIEWS AND UPDATES

- A. Minor updates
 - 1. The Enterprise Infrastructure Cabling Manager will review the document at least quarterly.
 - a. Changes that do not significantly affect scope of work, or contract pricing will be made, and the Rev number will be updated. (i.e. updated part numbers, etc.)
 - b. Significant changes will be made and added to the Change Log for review and approval of the Plant Cabling Initiative Team.
 - 1) When approved, they will be submitted to the EARB for approval; and then implemented in the new Version.
- B. Major updates
 - 1. The Plant Cabling Initiative Team will review the entire document at least once every three years.
 - a. This review will coincide with the release of new versions of NFPA70 (National Electrical Code) (2014, 2017, etc. - to be completed by the end of each designated year))
 - b. The review will cover standards adjustments that may be deemed necessary, and ensure compliance with applicable codes and standards.
 - 2. Upon completion of the reviews and updates, the standards document will be submitted for approval by the EARB.

END OF SECTION

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SECTION 27 6004

APPENDIX 04 – REFERENCE STANDARDS

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- A. Codes and Standards (Most recent editions with addenda/TSB, etc.) All materials, installation and workmanship shall meet or exceed the applicable requirements and standards addressed within the references listed below:
1. ANSI/TIA-568-C.0 and addenda "Generic Telecommunications Cabling for Customer Premises - Part 1: General Requirements"
 2. ANSI/TIA-568-C.1 and addenda "Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements"
 3. ANSI/TIA-568-C.2 and addenda "Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair"
 4. ANSI/TIA-568-C.3 and addenda "Commercial Building Telecommunications Cabling Standard - Part 3: Optical Fiber Cabling and Components Standard"
 5. ANSI/TIA/EIA-569-B and addenda "Commercial Building Standard for Telecommunications Pathways and Spaces"
 6. ANSI/TIA/EIA-606-B-1 and addenda "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings"
 7. ANSI-J-STD-607-B and addenda "Commercial Building Grounding and Bonding Requirements for Telecommunications"
 8. IEEE 802.3at PoE Plus and Next Gen PoE CFI March 2013 and IEEE P802.3ba latest draft revision and amendments.
 9. "Media Access Control Parameters, Physical Layers and Management Parameters for 40 Gbp/s and 100 Gbp/s Operation".
 10. ANSI/TIA/EIA-526-7 "Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant"
 11. ANSI/TIA/EIA-526-14A "Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant"
 12. ANSI/TIA-758-A, "Customer-Owned Outside Plant Telecommunications Infrastructure Standard"
 13. ANSI/TIA-942-A Data Center Standard Incorporate TIA-942 Addendum 1 (coaxial cables and E1, T1, E3, T3 circuit distances) - Incorporate TIA-942 Addendum 2 (RF interference, lighting levels, revised temperature & humidity, addition of Cat 6A, revised Tiering) and ONVIF 2.0 Profiling concept.
 14. ANSI/TIA – 1179 "Healthcare Facility Telecommunications Infrastructure Standard"
 15. IEC/TR3 61000-5-2 - Ed. 1.0 and amendments "Electromagnetic compatibility (EMC) - Part 5: Installation and mitigation guidelines - Section 2: Earthing and cabling"
 16. ISO/IEC 11801:2010 Ed2.0 and amendments "Information technology - Generic cabling for customer premises"
 17. CENELEC EN 50173:2000 and amendments "Information Technology - Generic cabling systems"
 18. AIA Guidelines for Hospital Telecommunication Facilities
 19. Construction Specification Institute MasterFormat
 20. BICSI: Comply with the most current editions of the following BICSI manuals:
 - a. BICSI - Telecommunications Distribution Methods Manual
 - b. BICSI – Installation Transport Systems Information Manual
 - c. BICSI – Network Design Reference Design Manual
 - d. BICSI – Outside Plant Design Reference Manual
 - e. BICSI – Wireless Design Reference Manual
 - f. BICSI -Electronic Safety and Security Design Reference Manual

- g. Infocomm/BICSI – AV Design Reference Manual
- 21. Underwriters Laboratories (UL) Cable Certification and Follow-Up Program.
- 22. National Electrical Manufacturers Association (NEMA)
- 23. American Society for Testing Materials (ASTM)
- 24. National Electrical Code (NEC) NFPA70 2011
- 25. National Electrical Safety Code (NESC) 2009
- 26. Institute of Electrical and Electronic Engineers (IEEE)
- 27. UL Testing Bulletin
- 28. Building Industry Consulting Services International (BICSI) Information Transport Systems Methods Manual (ITSMM)
- 29. Local, county, state and federal regulations and codes in effect as of date of installation.
- 30. Equipment of foreign manufacture must meet U.S. codes and standards. It shall be indicated in the proposal the components that may be of foreign manufacture, if any, and the country of origin.

END OF SECTION

SECTION 27 6005

APPENDIX 05 – DEFINITIONS AND ABBREVIATIONS

PART 1 - GENERAL

1.1 RELATED TERMS

- A. Codes and Standards (Most recent editions with addenda/TSB, etc.) All materials, installation and workmanship shall meet or exceed the applicable requirements and standards addressed within the references listed below:

1. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.
2. BICSI: Building Industry Consulting Service International.
3. CBC: Coupled Bonding Conductor
4. CFCI: Customer Furnished Customer Installed
5. Cable Run A single cable to a single location
6. Cable Drop Two cables to a single location
7. Cable Tr iDrop Three cables to a single location
8. CT Coupler A type of wall connector made by the Siemon Company
9. DCO Data Center Operations
10. Div. 1: Division 1 General and Performance Requirements
11. Div. 23: Division 23 Heating, Ventilating, and Air Conditioning
12. Div. 22: Division 22 Plumbing
13. Div. 26: Division 26 Electrical
14. Div. 27: Division 27 Communications and Audio Visual
15. Div. 28: Division 28 Electronic Safety and Security
16. E.E. Electrical Engineer
17. EMI: Electromagnetic Interference
18. F/UTP: Foil over Unshielded Twisted Pair. Individual pairs are unshielded.
19. GC General Contractor
20. GE: Ground Equalizer
21. Horizontal Cabling: The cable and connecting hardware utilized to transport communications signals
22. IDF: Intermediate Distribution Frame (Horizontal Distribution)
23. LAN: Local Area Network
24. MDF: Main Distribution Frame
25. MDR: Main Distribution Room
26. N/A: Not Applicable
27. NIC: Not In Contract
28. OFCI: Owner Furnished Contractor Installed
29. OFOI: Owner Furnished Owner Installed
30. OTDR: Optical Time Domain Reflectometer
31. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
32. RCDD: Registered Communications Distribution Designer
33. RFI: Radio Frequency Interference
34. TBA or TBD: To Be Determined
35. TDR: Technology Distribution Room
36. TEC: Technology Equipment Center
37. TGB: Telecommunications Ground Bus Bar
38. TMBC: Telecommunications Main Bonding Conductor
39. TMGB: Telecommunications Main Grounding Bus Bar
40. TR: Telecommunications Room
41. TSER: Telecommunications Service Entrance Room
42. UTP: Unshielded Twisted Pair

43. Work Area approx. 100 sq. ft. equipped for work station equipment

DCO = Data Center Operations Boe.Sausedo@imail.org

ICT = Infrastructure Cabling Team Wayne.Welling@imail.org

END OF SECTION

SECTION 27 6006

APPENDIX 06 – MATERIAL SUPPLIERS

PART 1 - GENERAL

1.1 RELATED TERMS

- A. Siemon Authorized Suppliers are listed below. To help prevent counterfeiting and support warranties, known, factory authorized distributors are recommended.

1. Approved Suppliers of Siemon cable, patch panels, jacks, and parts:

Anixter

Debie McGarry
Inside Sales
1837 South 4130 West Bldg. E
Salt Lake City, UT 84104 US
Main Phone: (801) 973-2121
Fax: (801) 973-4472
Email: debie.mcgarry@anixter.com

Karl Bartlam
End User/Outside Sales
1837 South 4130 West
Salt Lake City, UT 84104 US
Main Phone: (801) 973-2121
Direct: (801) 973- 2121
Email: karl.bartlam@anixter.com

Graybar Electric

Rob Long
Contractor Outside Sales
2841 South 900 West
Salt Lake City, UT 84119 US
Main Phone: (801) 975-1115
Fax: (801) 973-4314
Email: rob.long@gbe.com

WESCO / CSC

Christina Malichanh
Inside Sales
3210 South 900 West
Salt Lake City, UT 84119 US
Main Phone: (801) 606-4314
Fax: (801) 907-4450
Email: cmalichanh@gocsc.com

John Winterbottom
Contractor Outside Sales
3210 South 900 West
Salt Lake City, UT 84119 US
Main Phone: (801) 975-0600
Direct: (801) 907-2053
Email: jwinterbottom@gocsc.com

- B. The Siemon Company is represented locally by:

Rick Jones rick_jones@siemon.com

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SECTION 27 6007

APPENDIX 07 - SIEMON CI'S - 270100 - CERTIFIED INSTALLATION FIRMS, SIEMON APPROVED (27 MAY 2014)

PART 1 - GENERAL

1.1 RELATED TERMS

- A. The Horizontal Subsystem is the portion of the communications cabling system that extends from the work area communications outlet/connector to the Floor Distributor (FD)/Horizontal Cross-connect (HC) in the communications room (TDR). It consists of the communications outlet/connector, the horizontal cable, optional consolidation point, and that portion of the cross-connect in the telecommunications room serving the horizontal cable. Each floor of a building should be served by its own Floor Distributor/Horizontal (FD/HC) Subsystem located in the Communications Room (TDR) dedicated to that floor and area.

PART 2 - PRODUCT

2.1 CERTIFIED INSTALLERS

- A. NOTE: Cable installers have rigorous requirements to be certified for Siemon cables and products. Validation of certification is required prior to accepting a bid.
- B. The firms selected to bid must be pre-approved by the local facility IT manager. Installation firms desiring to do work for Intermountain Healthcare must be selected from the official CI list below.
- C. Current Siemon Approved/Certified Cable Installers for Siemon Network Cable This list is up to date as of 2014-05-27.
1. **Orion Integration Group:** 8880 W. Barnes Street, Boise, ID 83709
 2. **Niels Fugal Sons Co:** 1005 S Main St, Pleasant Grove, UT 84062 (801) 785-3152
 3. **IES Commercial:** 1960 S. Milestone, Suite D, Salt Lake City, UT 84104
 - a. Ryan Lewis - Project Manager // Phone 801 972 2262 / Fax 385 242 7366 / Mobile 801 381 1511 // ryan.lewis@iescomm.com / www.iescomm.com
 - b. Boyd Evans - Project Manager // Phone 801 975 8191 / Mobile 801 381 1518 / Fax 385 242 7366 // boyd.evans@iescomm.com / www.iescomm.com
 4. **Cache Valley Electric:** 1414 Gustin Rd. Salt Lake City, UT 84104
 - a. Travis Grant – Account Manager // Main Phone: (801) 908-4170 / Cell Phone: (801) 870-7226 / Fax: (801) 908-7401 // Email: Travis.Grant@cve.com
 5. **Americom Technology, Inc.:** 5123 So. Commerce Dr. Murray, UT 84107
 - a. Mike Herd – Project Manager // Main Phone: (801) 892-0500 / Fax: (801) 261-8357 // Email: mike.herd@americomtech.com
 6. DataPlus Communications: 769 Middlegate Road, Henderson, NV 89011: 702.795.3282
 7. Mojave Electric: 3755 W. Hacienda Ave., Las Vegas, NV 89118 (702) 798-2970
 8. The Morse Group: 3874 Silvestri Lane, Las Vegas, NV 89120 (702) 257-4400

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SECTION 276009

APPENDIX 09 - COMMON CABLE FILL SCENARIOS

PART 1 - GENERAL

1.1 COMMON CABLE FILL SCENARIOS

- A. The installer shall be responsible to verify all calculations and capacities, and to ensure the proper part has been selected per plans and specifications.
- B. CI's use the Ally website for the official specification.

END OF SECTION

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DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

Section 28 1300	Card Access Systems
Section 28 2300	Video Surveillance
Section 28 3111	Fire Alarm

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SECTION 281300
ACCESS CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section includes the installation of an expansion of the 21st floor PC based and managed access control and security system and specifies sensors, signal equipment, and system controls.

1.3 DEFINITIONS

- A. Hard-Wired System: Alarm, supervisory, and detection devices are directly connected, through individual dedicated conductors, to central control panels.

1.4 SYSTEM DESCRIPTION

- A. The system shall have both access-controlled doors and alarm inputs for intrusion detection.
- B. The system shall support automatic responses to alarms entering the system. Each alarm condition shall be capable of initiating numerous events including but not limited to: Activation of remote devices, door control, remote annunciation LED's, and card validation.
- C. Access control functions shall include but not be limited to: Validation based on time of day and day of week, holiday scheduling with card validation override, and access validation based on positive verification of card.
- D. The system shall interface with the fire alarm system and in the event of an alarm, shall release all controlled doors designated for emergency egress, and put them in fail-safe mode allowing free egress.

1.5 FUNCTIONAL PERFORMANCE

- A. The system shall consist of a network controller and network nodes using a standard TCP/IP network. Each controller shall retain all data necessary for system operation in its own RAM. Each controller will contain an integrated real time clock that continues to govern events even if communication with the main network controller is interrupted.
- B. The network controller shall act as an interface point with the node network, a data base management tool, and a transaction storage device.

- C. Contractor shall provide additional licensing as necessary for a complete and operational system in addition to new door controllers for each floor (10 and 16)

1.6 ACTION SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections
- B. Product data for system components, including "Nationally Recognized Testing Laboratory" (NRTL) listing data and list of materials, dimensioned plans, sections, and elevations showing minimum clearances, mounting arrangements, and installed features and devices.
- C. Wiring Diagrams and Door Elevations: Provide the following for each opening having electric hardware, except doors with only magnetic holder/release units.
 - 1. Wiring diagrams for scheduled items requiring power. Identify manufacturer-installed and field-installed wiring.
 - 2. Provide load calculations and requirements for each electro-mechanical locking device within +/-5% of 24 VDC. Size the conductors for each device appropriately to maintain this requirement.
 - 3. Provide cable type (as indicated on the Shop Drawings Wire Legend) that is used for each electro-mechanical locking device, the conductor size, the estimated total length of cable, the estimated line loss (voltage drop), and the percentage of estimated line loss (voltage drop).
- D. System operation description, including method of operation and supervision of each component and each type of circuit, and sequence of operations for all manually and automatically initiated system inputs. Description must cover this specific Project; manufacturer's standard descriptions for generic systems are not acceptable.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data for inclusion in "Operating and Maintenance Manual" specified in Division 01. Include data for each type product, including all features and operating sequences, both automatic and manual. Include user's software data and recommendations for spare parts to be stocked at the site. Provide names, addresses, and telephone numbers of service organizations that stock repair parts for the system.
- B. Product certifications signed by the manufacturers of system components certifying that their products comply with the referenced standards.
- C. Separate Qualification Data for Manufacturers and Installers: Demonstrate their capabilities and experience as specified in Quality Assurance Article. Include lists of completed projects with project names and addresses, names of Contracting Officer and Government representatives, plus other information specified.
- D. Record of field tests of system.

1.8 QUALITY ASSURANCE

- A. Comply with NFPA 70, "National Electrical Code."

- B. Listing and Labeling: Provide system and components that are listed and labeled for their indicated use and location on the Project.
 - 1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- C. Comply with UL Standard 609, 1023, and 1076.
- D. FM Compliance: Provide FM approved card access system and components.
- E. Single Source Responsibility: Obtain system components from a single source (the prime system manufacturer) that assumes responsibility for system components and for their compatibility.

1.9 COORDINATION

- A. Access Control System Electrical Coordination: Coordinate with the layout and installation of scheduled electrified door hardware, and related access control equipment, with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.
 - 1. Door Hardware Interface: The card key access control system shall interface and be connected to electronic door control hardware (electromechanical locks, electric strikes, magnetic locks, door position switches, other monitoring contacts, and related auxiliary control devices) as described under Division 8 "Door Hardware". Coordinate with the installation and configuration of specified door hardware being monitored or controlled with the controls, software and access control hardware specified in this Section.
 - 2. Access Control Hardware Sets: The hardware sets listed represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality. **Refer to Section 087100 Door Hardware Schedule for hardware set information.**

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 ACCESS CONTROL SYSTEM EQUIPMENT, GENERAL

- A. Surge Protection: Comply with minimum requirements of UL Standard 1449, "Transient Voltage Surge Suppressors," for each component using solid state devices and having a line voltage power source connection or an exterior underground signal connection.

- B. Provide at the locations identified, a complete and operational Access Control and Security System including but not limited to the following equipment:
 - 1. Card Readers
 - 2. Door Logic Panels
 - 3. Relay output contacts
 - 4. All power supplies and/or transformers
 - 5. All equipment, security devices, components, wire, cable, and mounting hardware as required to meet specification requirements and manufacturers documented installation procedures.
- C. Provide the quantity of new door licenses to the existing Lenel building package to accommodate the increased number of readers being added as part of this project.

2.3 PHYSICAL SECURITY APPLIANCE

- A. Physical Security Appliance (ACS): Stand-alone, modular multi-reader access controller shall be provided for standard door opening access control. The appliances shall communicate to the main system server using Ethernet TCP/IP, and shall serve as the data collection and communications interface between the system server and the various field devices such as card readers, alarm inputs and control outputs.
- B. Power Requirements: Each Physical Security Appliance (ACS) shall accept a power input voltage of 120 VAC, 60Hz. Maximum power draw shall be no more than 300W. The ACS shall generate appropriate DC voltage levels for on-board use as required. External lock power supplies shall be required and sized for the appropriate number of locks (plus 20%) associated with each distributed controller. All power outputs to external devices shall be current limited in accordance with class 2 power limited wiring standards
- C. Battery Backup: The power supplies inherent in the ACS shall have the capability of charging standard gel-cell batteries, and shall be capable of operating on direct battery backup. The ACS shall be capable of providing at least four hours of full operation backup time, and shall be capable of recharging its batteries in less than 48 hours. Batteries shall be mounted in a separate, dedicated battery shelf sized to contain the amount of batteries required.

2.4 ELECTRICAL POWER

- A. Normal System Power Supply: 120 V 60 Hz from locked disconnect device. System components are supplied with power through separate power supplies. Provide all required power supplies and associated transformers as specified by the manufacturer.
- B. Power Source Transfer: When normal power is interrupted, system is automatically switched to backup supply without degradation of critical system function or loss of signals or status data.
 - 1. Backup Source: Batteries in power supplies of individual system components. Such batteries are an integral part of power supplies of the components.
 - 2. Annunciation: Switching of the system or any system component to backup power is indicated as a change in system condition.

2.5 CARD ACCESS SYSTEM HARDWARE, GENERAL

- A. Types, features, accessories, and mounting conditions of individual devices are as indicated.

- B. Battery Backup: The access control panel shall be provided with back up battery power for up to four hours operation upon loss of AC power.
- C. Suppression: The access control panel shall have provisions for relay suppressor kits for each relay used, to protect the access control panel from collapsing electrical fields.
- D. Card Readers: Card readers shall be HID multiclass proximity readers.
 - 1. Proximity Readers: The system shall be provided with uni directional proximity card readers. The standard multiClass readers shall have a read range of five to eight inches. The reader shall be able to be mounted with its sides against metal door or window frames, and masonry walls.

2.6 POWER SUPPLIES

- A. Provide power supplies as per manufacturers written recommendations with total number of powered devices for each power supply restricted to only consuming 75 percent of the power supplies rated amperage. Provide separate power supplies for system controllers (As per manufacturer), card readers (12VDC, 5 A), and locks (24 VDC, 7 A).

2.7 CONTACT INDICATOR SWITCHES

- A. Contact indicators on doors that are not supplied by the door manufacturer shall be concealed button type magnetic reed type switches with opposing magnet, and shall be per manufacturer's recommendations for the type of door.

2.8 WIRE AND CABLE

- A. Cables: Bundled, shielded and unshielded, twisted-pair cable, shielded where manufacturer recommends shielded cable.
 - 1. Specified Manufacturer: Provide the specified product or prior approved equal.
 - a. Coleman Cable Inc. (CCI) Part Number 73101 consisting the following cables bundled plenum rated within a yellow Low Smoke PVC, CMP/CL3P/FPLP jacket:
 - 1) PN 72321: 22 AWG 2/Conductor CMP. Typical use, Door Contact
 - 2) PN 72344: 22 AWG 4/Conductor CMP. Typical use, Request to Exit/Spare
 - 3) PN 75366: 22 AWG 6/Conductor shielded CMP. Typical use, Card Reader.
 - 4) PN 71944: 18 AWG 4/Conductor CMP. Typical use, Lock Power
 - b. Any of the above cables may be used individually where cables in addition to those included in the bundle are required.
- B. Comply with Division 26 Section "Wires and Cables" except as indicated.
- C. Cable for Low Voltage Control and Signal Circuits: Shielded twisted pair cable with drain. Comply with Division 26 Section "Wires and Cables."

2.9 RACEWAY

- A. Comply with Division 26 Section "Raceways."

2.10 DOOR HARDWARE SCHEDULE

- A. Refer to Section 087100 Door Hardware Schedule for hardware set information and assignment of required components to be provided by the Division 28 contractor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.
- B. Examine roughing-in for card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with recommendations in SIA CP-01.
- B. Comply with TIA/EIA 606-A, "Administration Standard for Commercial Telecommunications Infrastructure."
- C. Obtain detailed Project planning forms from manufacturer of access-control system; develop custom forms to suit Project. Fill in all data available from Project plans and specifications and publish as Project planning documents for review and approval.
 - 1. For each Location, record setup of controller features and access requirements.
 - 2. Prepare a specific plan for system testing, startup, and demonstration.
 - 3. Develop acceptance test concept and, on approval, develop specifics of the test.
 - 4. Develop cable and asset-management system details; input data from construction documents.

3.3 INSTALLATION

- A. General: Install system according to NFPA 70, applicable codes, and manufacturer's printed instructions.
- B. Wiring Method:
 - 1. Concealed in walls or above inaccessible ceilings: Install all cabling in raceways, ¾ inch minimum. Conduit fill shall not exceed 40%.
 - 2. Above Accessible Ceilings: Provide J-Hooks at not more than 5 feet on center. Fasten J-Hooks to walls with solid anchoring to studs. Where wall are unavailable suspend from structure using not less than 3/8" diameter threaded rod and provide tie to ceiling grid to prevent sway.
 - 3. Exposed: Install exposed cables in minimum 3/4" galvanized rigid metal conduit with straps at not more than 3 feet on center and minimum 1/4" gap between conduit and building surface. Use boxes that are specified for surface mounting.

- C. Wiring within Panels and Enclosures: Bundle, wrap, and train the conductors to terminal points with 6-inches of slack minimum, 12-inches of slack maximum. Provide and use cable management hardware and distribution spools.
- D. Number of Conductors: As recommended by system manufacturer for functions indicated. As a minimum install one bundled, shielded and unshielded, twisted pair cable for every access controlled door.
- E. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull and outlet boxes, terminal cabinets, and equipment enclosures.
- F. Tighten connections to comply with tightening torques specified in UL Standard 486A.
- G. Identification of Conductors and Cables: Color code conductors and apply wire and cable marking tape to designate wires and cables so media are identified and coordinated with system wiring diagrams.
- H. Install power supplies and other auxiliary components for detection devices at the door controller panel or at a data gathering panel except as otherwise indicated. Do not install such items in the vicinity of the devices they serve.

3.4 GROUNDING

- A. Comply with Section 280526 "Grounding and Bonding for Electronic Safety and Security."
- B. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."
- C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
- D. Bond shields and drain conductors to ground at only one point in each circuit.

3.5 DOOR RELEASE BUTTON INSTALLATION

- A. Push Buttons: Where multiple push buttons are housed within a single switch enclosure, they shall be stacked vertically with each push-button switch labeled with 1/4-inch- high text and symbols as required. Push-button switches shall be connected to the controller associated with the portal to which they are applied, and shall operate the appropriate electric strike, electric lock, or other facility release device.

3.6 IDENTIFICATION

- A. In addition to requirements in this article, comply with applicable requirements in Section 260553 "Identification for Electrical Systems" and with TIA/EIA 606-A.
- B. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 - 1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.

2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

3.7 FIELD QUALITY CONTROL

- A. **Manufacturer's Field Services:** Provide services of a factory authorized service representative to supervise the field assembly and connection of components and system pre-testing, testing, adjustment, and programming.
- B. **Inspection:** Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
- C. **Pre-testing:** Align and adjust the system and perform pre-testing of all components, wiring, and functions to verify conformance with specified requirements. Correct deficiencies by replacing malfunctioning or damaged items with new items. Retest until satisfactory performance and conditions are achieved.
- D. **Testing:** Provide at least 10 days' notice of acceptance test performance schedule.
- E. **Operational Tests:** Perform operational system tests to verify conformance with specifications. Test all modes of system operation and intrusion detection. Methodically test for false alarms in each zone of space intrusion detection devices by simulating activities outside indicated detection patterns.
- F. **Installer Start-up Responsibility:** The Installer shall initiate system operation. The Installer shall provide competent start up personnel on each consecutive working day until the system is fully functional. Upon reoccurring technical problems, the Installer shall supply factory direct Manufacturer's support in the form of factory technical representation and/or diagnostic equipment until the resolution of those defined problems.

3.8 ADJUSTMENT

- A. **Occupancy Adjustments:** When requested within 1 year of date of substantial completion, provide on site assistance in adjusting and reprogramming to suit actual occupied conditions. Provide up to 3 visits to the site for this purpose without additional cost.

3.9 DEMONSTRATION

- A. Train Owner's operating personnel in the programming and operation of the system. Train Owner's maintenance personnel in the procedures and schedules involved in preventive maintenance and in programming, operating, adjusting, troubleshooting, and servicing of the system. Provide a minimum of 4 hours training.
- B. Schedule training with advance notice of at least 7 days.

END OF SECTION

SECTION 282300

VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes a video surveillance system consisting of cameras, software installation, configuration, and licensing. Network electronics shall be provided by the Owner. Cabling and terminations shall be provided by Section 271000.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
 - 3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
 - 4. Wiring Diagrams: For power, signal, and control wiring.
- C. Equipment List: Include every piece of equipment by model number, manufacturer, location, and date of original installation.
- D. Field quality-control reports.
- E. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NECA 1.
- C. Comply with NFPA 70.
- D. Electronic data exchange between video surveillance system with an access-control system shall comply with SIA TVAC.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

- A. Video-signal format shall comply with IP based digital transmission.
- B. Surge Protection: Protect components from voltage surges entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.
 - 1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Division 26 Section "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits."
 - 2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Division 26 Section "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits." as recommended by manufacturer for type of line being protected.
- C. Tamper Protection: Tamper protection capability shall be provided as part of the camera manufacture and design.

2.2 CAMERAS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AXIS
- B. Description: Camera shall be an all-in-one solution with integrated megapixel camera, varifocal lens, and dome enclosure. Refer to camera type schedule in the drawings.

2.3 CAMERA-SUPPORTING EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AXIS
- B. Minimum Load Rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.
- C. Mounting Brackets for Fixed Cameras: Type matched to items supported and mounting conditions. Include manual pan-and-tilt adjustment.
- D. Protective Housings for Fixed Cameras: Dome type enclosures with internal camera mounting and connecting provisions that are matched to camera/lens combination and mounting and installing arrangement of camera to be housed. Dome enclosures mounted outside shall be manufactured with environmental features for sustained function in all expected temperatures.

2.4 IP VIDEO MANAGEMENT SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Genetec
- B. Description:
 - 1. System shall provide high-quality delivery and processing of IP-based video, audio, and control data using standard Ethernet-based networks.
 - 2. System shall have seamless integration of all video surveillance and control functions.
 - 3. System design shall include all necessary compression software for high-performance, dual-stream, MPEG-2/MPEG-4/h.264 video. Unit shall provide connections for all video cameras, camera PTZ control data, bidirectional audio, discreet sensor inputs, and control system outputs.
 - 4. All camera signals shall be compressed, encoded, and delivered onto the network for processing and control by the IP video-management software.
 - 5. All system interconnect cables, camera licenses, workstation programming, and other system intermediate devices shall be provided for full performance of specified system.

2.5 SIGNAL AND POWER TRANSMISSION COMPONENTS

- A. Cable: Four pair, 100 ohm, Category 6 compliant UTP. (By Section 271500)
- B. Video Surveillance Cable Connectors: Category 6 compliant. (By Section 271500)
- C. Camera Power: POE enabled network switches. (By Owner)

PART 3 - EXECUTION

3.1 VIDEO SURVEILLANCE SYSTEM INSTALLATION

- A. Install cameras at heights noted in drawings.
- B. Set pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms, and adjust.
- C. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
 - 2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:
 - a. Verify operation of auto-iris lenses.

- b. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
 - c. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
 - d. Set sensitivity of motion detection.
 - e. Connect and verify responses to alarms.
 - f. Verify operation of control-station equipment.
- 3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
 - 4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation.
- C. Video surveillance system will be considered defective if it does not pass tests and inspections.
 - D. Prepare test and inspection reports.

3.3 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

END OF SECTION

SECTION 283111

FIRE ALARM

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 fire alarm systems with manual stations, detectors, signal equipment, controls, and devices.

1.3 DEFINITIONS

- A. FACP: Fire alarm control panel.
- B. LED: Light-emitting diode.
- C. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.4 SYSTEM DESCRIPTION

- A. General: Noncoded, addressable-analog system with manual and automatic alarm initiation; automatic sensitivity control of certain smoke detectors; and multiplexed signal transmission dedicated to fire alarm service only.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Wiring Diagrams: Detail wiring and differentiate between manufacturer-installed and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified.
 - 2. Battery: Sizing calculations.
 - 3. Floor Plans: Indicate final outlet locations and routings of raceway connections.
 - 4. Device Address List: Coordinate with final system programming.
 - 5. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
- C. Operating Instructions: For mounting at the FACP.
- D. Product Certificates: Signed by manufacturers of system components certifying that products furnished comply with requirements.
- E. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.
- F. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Comply with NFPA 72.

- G. Maintenance Data: For fire alarm systems to include in maintenance manuals specified in Division 1. Comply with NFPA 72.
- H. Submissions to Authorities Having Jurisdiction: In addition to distribution requirements for Submittals specified in Division 1 Section "Submittals," make an identical submission to authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.
- I. Certificate of Completion: Comply with NFPA 72.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is an authorized representative of the FACP manufacturer for both installation and maintenance of units required for this Project.
- B. Manufacturer Qualifications: A firm experienced in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance.
- C. Source Limitations: Obtain fire alarm system components through one source from a single manufacturer.
- D. Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.
- E. Comply with NFPA 72.

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. Horn/Strobe and Strobe Units: Quantity equal to 10 percent of amount installed, but not less than one unit.
 - 2. Keys and Tools: One extra set for access to locked and tamperproofed components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Compatible with the existing fire alarm system in the building.

2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

- A. Control of System: By the FACP.
- B. System Supervision: Automatically detect and report open circuits, shorts, and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.
- C. Priority of Signals: Automatic alarm response functions resulting from an alarm signal from one zone or device are not altered by subsequent alarm, supervisory, or trouble signals. An alarm signal is the highest priority. Supervisory and trouble signals have second- and third-level priority. Higher-priority signals take precedence over signals of lower priority, even

when the lower-priority condition occurs first. Annunciate and display all alarm, supervisory, and trouble signals regardless of priority or order received.

- D. Noninterference: A signal on one zone shall not prevent the receipt of signals from other zones.
- E. System Reset: All zones are manually resettable from the FACP after initiating devices are restored to normal.
- F. Transmission to Remote Alarm Receiving Station: Automatically route alarm, supervisory, and trouble signals to a remote alarm station by means of a digital alarm communicator transmitter and telephone lines.
- G. System Alarm Capability during Circuit Fault Conditions: System wiring and circuit arrangement prevent alarm capability reduction when a single ground or open circuit occurs in an initiating device circuit, signal line circuit, or notification-appliance circuit.
- H. Loss of primary power at the FACP initiates a trouble signal at the FACP and the annunciator. An emergency power light is illuminated at both locations when the system is operating on the secondary power supply.
- I. Basic Alarm Performance Requirements: Unless otherwise indicated, operation of initiating device initiates the sequence of operation as indicated in the fire alarm matrix.
- J. Alarm Silencing, System Reset and Indication: Controlled by switches in the FACP and the remote annunciator.
 - 1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
 - 2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
 - 3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.
- K. Water-flow alarm switch operation initiates the following:
 - 1. Notification-appliance operation.
 - 2. Flashing of the device location-indicating light for the device that has operated.
- L. Operating a heat detector in the elevator shaft shuts down elevator power by operating a shunt trip in a circuit breaker feeding the elevator.
 - 1. A field-mounted relay actuated by the fire detector or the FACP closes the shunt trip circuit and operates building notification appliances and annunciator.
- M. Sprinkler valve-tamper switch operation initiates the following:
 - 1. A supervisory, audible, and visible "valve-tamper" signal indication at the FACP and the annunciator.
 - 2. Flashing of the device location-indicating light for the device that has operated.
 - 3. Recording of the event by the system printer.
 - 4. Transmission of supervisory signal to remote alarm receiving station.
- N. Removal of an alarm-initiating device or a notification appliance initiates the following:
 - 1. A "trouble" signal indication at the FACP and the annunciator for the device or zone involved.
 - 2. Recording of the event by the system printer.
 - 3. Transmission of trouble signal to remote alarm receiving station.

- O. Printout of Events: On receipt of the signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble), and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including the same information for device, location, date, and time. Commands initiate the printout of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.
- P. FACP Alphanumeric Display: Plain-English-language descriptions of alarm, supervisory, and trouble events; and addresses and locations of alarm-initiating or supervisory devices originating the report. Display monitoring actions, system and component status, system commands, programming information, and data from the system's historical memory.

2.3 NOTIFICATION APPLIANCES

- A. Description: Equip for mounting as indicated and have screw terminals for system connections.
 - 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.
- B. Selectable-Tone Horns: Electronic-vibrating type, field selectable tone (temporal pattern, chime, high/low/silent), 24 VDC, Horns produce a sound-pressure level of 90dBA, measured 10 feet (3m) from the horn. Built-in provisions for reducing the output to 87dBA and 84dBA.
- C. Weather-Proof Horns (outdoors only): Electronic-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns produce a sound-pressure level of 90 dB, measured 10 feet (3 m) from the horn.
- D. Visible Alarm Devices: Xenon strobe lights listed under UL 1971 with clear polycarbonate lens. Mount lens on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
 - 1. Rated Light Output: as shown on drawings, field selectable outputs of 15CD, 30CD, 75CD, and 110CD.
 - 2. Sleeping Room Rated Light Output: 177CD.
 - 3. Synchronization.
 - 4. Strobe Leads: Factory connected to screw terminals.

2.4 ADDRESSABLE INTERFACE DEVICE

- A. Description: Microelectronic monitor module listed for use in providing a multiplex system address for listed fire and sprinkler alarm-initiating devices with normally open contacts.
- B. Integral Relay: Capable of providing a direct signal to the elevator controller to initiate elevator recall or to a circuit-breaker shunt trip for power shutdown.

2.5 WIRE

- A. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
 - 1. Low-Voltage Circuits: No. 16 AWG, minimum.
 - 2. Line-Voltage Circuits: No. 12 AWG, minimum.
- B. Power-Limited Circuits: NFPA 70, Types FPL, FPLR, or FPLP, as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.
- B. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.
 - 1. Synchronization: synchronize any two strobes located such that they are visible from the same location.
- C. FACP: Surface mount with tops of cabinets not more than 72 inches above the finished floor.

3.2 WIRING INSTALLATION

- A. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceways and Boxes." Conceal raceway except in unfinished spaces and as indicated.
- B. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- C. Cable Taps: Use numbered terminal strips in junction, pull and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- D. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.
- E. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signal from other floors or zones.
- F. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Common Work Result for Electrical."
 - 1. Paint all fire alarm system junction boxes, device boxes, and pull boxes with red paint.
- B. Install instructions frame in a location visible from the FACP.
- C. Prepare laminated drawings showing each device and identifying the device address or zone
- D. Paint power-supply disconnect switch red and label "FIRE ALARM."

3.4 GROUNDING

- A. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

- B. Install grounding electrodes of type, size, location, and quantity as indicated. Comply with installation requirements in Division 26 Section "Grounding."
- C. Ground equipment and conductor and cable shields. For audio circuits, minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and connections and to supervise pretesting, testing, and adjustment of the system. Report results in writing.
- B. Pretesting: After installation, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the compliance of the system with requirements of Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones, and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
- C. Report of Pretesting: After pretesting is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of witnesses to preliminary tests.
- D. Final Test Notice: Provide a minimum of 10 days' notice in writing when the system is ready for final acceptance testing.
- E. Minimum System Tests: Test the system according to procedures outlined in NFPA 72. Minimum required tests are as follows:
 - 1. Verify the absence of unwanted voltages between circuit conductors and ground.
 - 2. Test all conductors for short circuits using an insulation-testing device.
 - 3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on record drawings.
 - 4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
 - 5. Test initiating and indicating circuits for proper signal transmission under open circuit and ground fault conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
 - 6. Test each initiating and indicating device for alarm operation and proper response at the control unit.
 - a. Test smoke detectors with actual products of combustion.
 - b. Test each heat detector with hair dryer or other means approved by the manufacturer.
 - c. Test fan shut down, sprinkler flow and tamper switches, door closers, magnetic door holders, and elevator return.
 - 7. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications.
 - 8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.
 - a. Disconnect fire alarm from primary power source 24 hours prior to test, or longer as specified. Test all indicating devices to determine whether audio and visual devices comply with testing requirements for a 15 minute test.

- F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets Specifications and complies with applicable standards.
 - G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log on the satisfactory completion of tests.
 - H. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.
- 3.6 CLEANING AND ADJUSTING
- A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.
- 3.7 DEMONSTRATION
- A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
 - 1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, adjusting, and maintaining equipment and schedules. Provide a minimum of 8 hours' training.
 - 2. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid.
 - 3. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- 3.8 ON-SITE ASSISTANCE
- A. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit actual occupied conditions. Provide up to three requested visits to Project site for this purpose.

END OF SECTION 283111

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DIVISION 29 thru DIVISION 48

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