

Construction Documents

January, 2018

INTERMOUNTAIN WTC 19 INTERMOUNTAIN KBT 22

36 South State Street
Salt Lake City, Utah

project manual

ajc project number: 1750.01

prepared by;

ajc architects

703 east 1700 south, salt lake city, utah 84105

project no. 1750.01



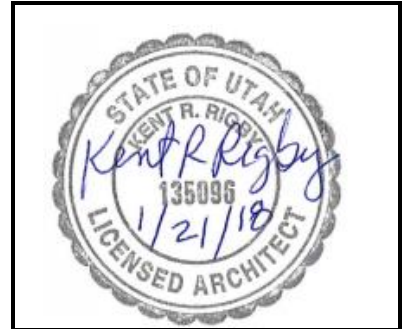
ajc architects

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

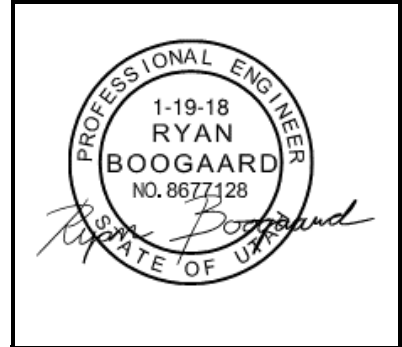
DOCUMENT 000107 - SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

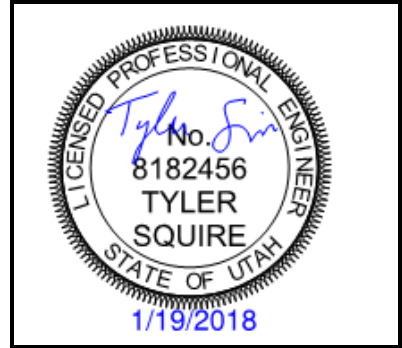
ARCHITECT
ajc architects
703 East 1700 South
Salt Lake City, Utah 84105
1.801.466.8818
Contact: Justin Heppler, AIA



MECHANICAL
ENGINEER
SPECTRUM ENGINEERING
324 SOUTH STATE STREET, SUITE 400
Salt Lake City, Utah 84111
1.801.328.5151
Contact : RYAN BOOGAARD



ELECTRICAL
ENGINEER
SPECTRUM ENGINEERING
324 SOUTH STATE STREET, SUITE 400
Salt Lake City, Utah 84111
1.801.328.5151
Contact : TYLER SQUIRE



END OF DOCUMENT 000107

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

PROJECT MANUAL

TABLE OF CONTENTS

INTERMOUNTAIN WTC 19 INTERMOUNTAIN KBT 22

VOLUMN ONE

SEALS PAGE	1 – 2
PROJECT MANUAL TABLE OF CONTENTS	1 – 6

<u>Section</u>	<u>Title</u>	<u>Pages</u>
DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIRMENTS		
002600	PROCUREMENT SUBSTITUTION PROCEEDURES	1 – 2
002605	CSI FORM 1.5C SUBSTITUTION REQUEST	1 – 2
003100	AVAILABLE PROJECT INFORMATION	1 – 2
007200	GENERAL CONDITIONS	1 – 2
007300	SUPPLEMENTARY CONDITIONS	1 – 2
DIVISION 01 - GENERAL REQUIREMENTS		
010000	GENERAL REQUIREMENTS	1 – 4
011000	SUMMARY	1 – 6
012500	SUBSTITUTION PROCEDURES	1 – 4
	SUBSTITUTION REQUEST FORM	1 – 2
012600	CONTRACT MODIFICATION PROCEDURES	1 – 4
012900	PAYMENT PROCEDURES	1 – 6
013100	PROJECT MANAGEMENT AND COORDINATION	1 – 10
013200	CONSTRUCTION PROGRESS DOCUMENTATION	1 – 8
013233	PHOTOGRAPHIC DOCUMENTATION	1 – 6
013300	SUBMITTAL PROCEDURES	1 – 12
	SUBMITTAL TRANSMITTAL	1 – 2
	AJC ELECTRONIC RELEASE FORM	1 – 2
014000	QUALITY REQUIREMENTS	1 – 10
015000	TEMPORARY FACILITIES AND CONTROLS	1 – 12
016000	PRODUCT REQUIREMENTS	1 – 6
017300	EXECUTION	1 – 10
017419	CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL	1 – 4
017700	CLOSEOUT PROCEDURES	1 – 8
017823	OPERATION AND MAINTENANCE DATA	1 – 8
017839	PROJECT RECORD DOCUMENTS	1 – 4
017900	DEMONSTRATION AAND TRAINING	1 – 6
DIVISION 02 - EXISTING CONDITIONS		
024119	SELECTIVE DEMOLITION	1 – 8
DIVISION 03 - CONCRETE		
	(NOT USED)	

DIVISION 04 - MASONRY

044200	DIMENSION STONE CLADDING	1 – 6
--------	--------------------------	-------

DIVISION 05 - METALS

055000	METAL FABRICATIONS	1 – 8
057000	DECORATIVE METALS	1 – 6

DIVISION 06 - WOOD AND PLASTICS

061053	MISCELLANEOUS ROUGH CARPENTRY	1 – 6
064116	PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS	1 – 10
064216	FLUSH WOOD PANELING	1 – 6
064400	ORNAMENTAL WOODWORK	1 – 4

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

072100	ACOUSTIC INSULATION	1 – 6
078413	PENETRATION FIRESTOPPING	1 – 8
078443	JOINT FIRESTOPPING	1 – 8
079200	JOINT SEALANTS	1 – 14

DIVISION 08 - DOORS AND WINDOWS

081113	HOLLOW METAL FRAMES	1 – 8
081210	INTERIOR ALUMINUM DOORS, DOOR FRAMES AND STOREFRONT FRAMING	1 – 4
081433	STILE AND RAIL WOOD DOORS	1 – 6
083113	ACCESS DOORS AND FRAMES	1 – 4
087100	DOOR HARDWARE	1 – 20
088000	GLAZING	1 – 10
088300	MIRRORS	1 – 6

DIVISION 09 - FINISHES

092216	NON-STRUCTURAL METAL FRAMING	1 – 8
092900	GYPSUM BOARD	1 – 8
093013	TILING	1 – 14
095113	ACOUSTICAL PANEL CEILINGS	1 – 12
095114	COLOR ACOUSTICAL PANEL CEILINGS	1 – 4
095426	LINEAR WOOD CEILINGS AND WALL	1 – 6
096400	WOOD TILE PAVER FLOORING	1 – 6
096513	RESILIENT BASE AND ACCESSORIES	1 – 6
096519	RESILIENT TILE FLOORING	1 – 6
096533	RESILIENT ESD VINYL TILE FLOORING	1 – 8
096813	TILE CARPETING	1 – 4
097200	WALL COVERINGS	1 – 6
099123	PAINTING	1 – 8

DIVISION 10 - SPECIALTIES

101100	VISUAL DISPLAY BOARDS	1 – 4
101423	PANEL SIGNAGE	1 – 6
102113	STAINLESS STEEL TOILET COMPARTMENTS	1 – 6
102600	WALL AND DOOR PROTECTION	1 – 6
102800	TOILET, BATH, CLOSET AND LAUNDRY ACCESSORIES	1 – 6
104413	FIRE EXTINGUISHER CABINETS	1 – 6
104416	FIRE EXTINGUISHERS	1 – 4
105113	PLASTIC-LAMINATE LOCKERS	1 – 6

DIVISION 11 – EQUIPMENT		
113100	APPLIANCES	1 – 6
DIVISION 12 – FURNISHINGS		
122113	HORIZONTAL LOUVER BLINDS	1 – 6
122413	ROLLER WINDOW SHADES	1 – 6
123661	SOLID SURFACE COUNTERTOPS	1 – 4
123662	QUARTZ AGGLOMERATE COUNTERTOPS AND WALLS	1 – 6
DIVISION 13 - SPECIAL CONSTRUCTION		
(NOT USED)		
DIVISION 14 - CONVEYING SYSTEMS		
(NOT USED)		
DIVISION 21- FIRE SUPPRESSION		
211313	WET PIPE SPRINKLER SYSTEMS	1 – 12
DIVISION 22 – PLUMBING		
220517	SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING	1 – 4
220518	ESCUTCHIONS FOR PLUMBING PIPING	1 – 2
220523	GENERAL-DUTY VALVES FOR PLUMBING PIPING	1 – 4
220529	HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT	1 – 10
220553	IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT	1 – 4
220719	PLUMBING PIPING INSULATION	1 – 18
221116	DOMESTIC WATER PIPING	1 – 12
221119	DOMESTIC WATER PIPING SPECIALTIES	1 – 18
221300	SANITARY WASTE AND VENT PIPING	1 – 12
221319	SANITARY WASTE PIPING SPECIALTIES	1 – 10
223300	ELECTRIC DOMESTIC WATER HEATERS	1 – 8
224216.13	COMMERCIAL SINKS	1 – 8
224713	DRINKING FOUNTAINS	1 – 4
DIVISION 23 - HEATING, VENTILATIONING, AND AIR CONDITIONING		
230513	COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT	1 – 4
230517	SLEEVES AND SLEEVE SEALS FOR HVAC PIPING	1 – 10
230519	METERS AND GAGES FOR HVAC PIPING	1 – 10
230529	HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT	1 – 10
230548	VIBRATION AND SEISMIC CONTROLS FOR HVAC	1 – 10
230553	IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT	1 – 6
230593	TESTING, ADJUSTING AND BALANCING FOR HVAC	1 – 14
230713	DUCT INSULATION	1 – 14
230719	HVAC PIPING INSULATION	1 – 20
230923.11	CONTROL VALVES	1 – 14
232113	HYDRONIC PIPING	1 – 12
232116	HYDRONIC PIPING SPECIALTIES	1 – 6
232513	WATER TREATMENT FOR CLOSED LOOP HYDRONIC SYSTEMS	1 – 6
233113	METAL DUCTS	1 – 16
233300	AIR DUCT ACCESSORIES	1 – 8
233423	HVAC POWER VENTILATOR	1 – 6
233600	AIR TERMINAL UNITS	1 – 12
233713	DIFFUSERS, REGISTERS AND GRILLES	1 – 6

DIVISION 25 - INTERGRATED AUTOMATION

(NOT USED)

DIVISION 26 – ELECTRICAL

260500	COMMON WORK RESULTS FOR ELECTRICAL	1 – 8
260519	LOW-VOLTAGE ELECTRICAL POWER CONDUCTOERS AND CABLES	1 – 4
260526	GROUNDING AND BONDING FOR ELECTRICAL SYSTMIS	1 – 6
260533	RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS	1 – 8
260548	VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS	1 – 6
260923	LIGHTING CONTROL DEVICES	1 – 6
262200	LOW-VOLTAGE TRANSFORMERS	1 – 6
262416	PANELBOARDS	1 – 8
262726	WIRING DEVICES	1 – 8
265100	INTERIOR LIGHTING	1 – 10

DIVISION 27 – COMMUNICATIONS

270000	COMMON GENERAL CONDIONS FOR COMMUNICATIONS SECTIONS	1 – 10
270100	OPERATION / MANINTENANCE OF COMMUNICATION SYSTEMS	1 – 4
270113	WARRANTY, PRODUCT AND SYSTEM	1 – 2
270119	FIELD TESTING AND REPORTING	1 – 6
270133	SHOP DRAINGS, PRODUCT DATA, SAMPLES, DESIGN RECORDS AND EXISTING CONDITIONS	1 – 4
270143	QUALIFICATIONS AND REQUIRED TRAINING FOR CONTRACTOR AND INSTALLER	1 – 2
270171	RESPONSIBILITY AND WORKMANSHIP OF CONTRACTOR	1 – 4
270186	PERFORMANCE REQUIRMENTS AND APPLICATIONS SUPPORTED	1 – 2
270500	COMMON WORK RESULTS FOR COMMUNICATIONS	1 – 2
270526	GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS	1 – 4
270528	PATHWAYS FOR COMMUNICAATIONS SYSTEMS	1 – 6
270529	HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS	1 – 2
270533	CONDUITS AND BACK BOXES FOR COMMUNICATIONS SYSTEMS	1 – 2
270536	CABLE TRAYS FOR COMMUNICATIONS SYSTEMS	1 – 6
270539	SURFACE RACEWAYS FOR COMMUNICATIONS SYSTEMS	1 – 2
270553	IDENTIFICATIONS FOR LOW-VOLTAGE CABLES AND LABELING	1 – 4
271100	EQUIPMENT ROOM FITTINGS	1 – 8
271116	CABINETS, RACKS, FRAMES AND ENCLOSURES	1 – 2
271119	TERMINATION BLOCKS AND PATCH PANELS	1 – 2
271123	CABLE MANAGEMENT AND LADDER RACK	1 – 2
271300	BACKBONE CABLING	1 – 4
271500	HORIZONTAL CABLING	1 – 4
271513	COPPER CABLE	1 – 2
271543	FACEPLATES AND CONNECTORS	1 – 4
271619	PATCH CABLES	1 – 2
274114	AUDIO SYSTEMS	1 – 12
274115	VIDEO SYSTEMS	1 – 10
274116	CONTROL SYSTEMS	1 – 26
275119	SOUND MASKING SYSTEMS	1 – 10
276001	APPENDIX 01 – DIVIATION REQUQUEST PROCESS	1 – 4
276002	APPENDIX 02 – DOCUMENT REFRESH PROCESS	1 – 2
276004	APPENDIX 04 – REERENCE STANDARDS	1 – 2
276005	APPENDIX 05 – DEFINITIONS AND ABBREVIATIONS	1 – 2
276006	APPENDIX 06 – MATERIAL SUPPLIERS	1 – 2
276007	APPENEDIX 07 – SIEMON CI'S – 270100 – CERTIFIED INSTALLATION FIRMS, SIEMON APPROVED (27 MAY 2014)	1 – 2

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

281300 CARD ACCESS SYSTEMS

1 – 10

282303 VIDEO SURVEILLANCE

1 – 6

283111 DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

1 – 8

DIVISION 31 - EARTHWORK

(NOT USED)

DIVISION 32 - EXTERIOR IMPROVEMENTS

(NOT USED)

DIVISION 33 - UTILITIES

(NOT USED)

THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT 002600 - PROCUREMENT SUBSTITUTION PROCEDURES

1.1 DEFINITIONS

- A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.
- B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 012500 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

1.2 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.3 PROCUREMENT SUBSTITUTIONS

- A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.
- B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:
 - 1. Extensive revisions to the Contract Documents are not required.
 - 2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
 - 3. The request is fully documented and properly submitted.

1.4 SUBMITTALS

- A. Procurement Substitution Request: Submit to Architect. Procurement Substitution Request must be made in writing in compliance with the following requirements:
 - 1. Requests for substitution of materials and equipment will be considered if received no later than 10 days prior to date of bid opening.
 - 2. Submittal Format: Submit three copies of each written Procurement Substitution Request, using or CSI Substitution Request Form 1.5C, or one electronic submittal.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.
- b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:
 - 1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.
 - 2) Copies of current, independent third-party test data of salient product or system characteristics.
 - 3) Samples where applicable or when requested by Architect.
 - 4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - 5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - 6) Research reports, where applicable, evidencing compliance with building code in effect for Project, from ICC-ES.
 - 7) 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, which will become necessary to accommodate the proposed substitute.
- c. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.
- d. Bidder, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. Architect's Action:

1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

- C. Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF DOCUMENT 002600

CSI Form 1.5C

**SUBSTITUTION
REQUEST**
(During the Bid Period)

Project: _____ Substitution Request Number: _____

From: _____

To: _____ Date: _____

A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: _____

Date: _____

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 003100 – AVAILABLE PROJECT INFORMATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This section references other information relevant to the construction of this Project that is available project information.
- B. At the request of the Owner, the information identified below represents services that have been provided by others, not as an Architects consultant, regarding conditions that affect this Project that are beyond the responsibilities of the Architect and Architects Consultants. Reference to such information herein is solely for the convenience of the Owner, Architect makes no representation, express or implied, as to the accuracy or validity of the information.
- C. Bidders are expected to examine the site and the information available from the Owner to determine for themselves the conditions to be encountered.
- D. If conditions other than those indicated in the information available from the Owner are encountered before or during construction, notify the Owner before work continues.

1.2 TAX EXEMPTION STATUS INFORMATION

- A. This project qualifies for exemption from taxes and the Owner will provide a letter for documentation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 003100

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 005000 – AIA DOCUMENT FORMS

1. AIA Documents, but not limited to, or Software-generated forms with substantially the same content that may be used on this project.

AIA Document G701 - 2001, Change Order.

AIA Document G702 – 1992, Application and Certificate for Payment.

AIA Document G703 – 1992, Continuation Sheet , Application and Certificate for Payment.

AIA Document G704 – 2000, Certificate of Substantial Completion.

AIA Document G706A – 1994, Contractor's Affidavit of Release of Liens.

AIA Document G707 – 1994, Consent of Surety to Final Payment.

AIA Document G710 – 1992, Architect's Supplemental Instructions.

AIA Document G714 – 2007, Construction Change Directive.

END OF DOCUMENT

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 007200 - GENERAL CONDITIONS

PART 1 - GENERAL

1.1 GENERAL

- A. The general Conditions of this Contract are that which is referenced in the Owner-Contractor Agreement and here-in after is referred to as the "General Conditions."
- B. A copy of the Document is not included in this Project Manual, but shall apply to each and every Section of the Work as though written in full therein.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 007200

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 007300 – SUPPLEMENTARY CONDITIONS

PART 1 - GENERAL

1.1 GENERAL

- A. The supplementary Conditions modify, change, delete from or add to the General Conditions and shall apply to each and every Section of the Work as though written in full therein.
- B. The following paragraphs and subparagraphs take precedence over the General Conditions. Where any part of the General Conditions is modified or deleted by the Supplementary Conditions, the unaltered provision remain in effect.
- C. Correlation and intent of the Contract Documents:
 - 1. Sections of Division 01 – General Requirements govern the execution of all sections of the specifications.
 - 2. Summary paragraphs placed at the beginning of the Section present a brief indication of the principal Work included in that section, but do not limit work to subject mentioned nor purport to itemize work that may be included.
 - 3. The relation of Specifications and Drawings shall be equal authority and priority. Should they disagree in themselves, or with each other, bids shall be based on the most expensive combination of quality and quantity of work indicated. The appropriate Work, in the event of the above-mentioned disagreements shall be determined by the Architect.
 - 4. Should the Drawings disagree themselves, figures shall govern over scaled measurements, large scaled Drawings shall govern over small scale drawings, the greater quantity of work or materials shall be furnished and performed, the descriptive writings shall govern over legends indicating material or conditions and the Agreement takes precedence over all other Contract Documents.
 - 5. Failure to report a conflict in the Contract Documents shall be deemed evidence that the Contractor has elected to proceed in the more expensive manner.

1.2 INTERPRETATION

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.3 INFORMATIONAL SUBMITTALS

- A. Informational submittals may be so identified in the Contract Documents.

1.4 PROFESSIONAL CERTIFICATION

- A. When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 010000

SECTION 010010 – GENERAL REQUIREMENTS

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 general requirements that are to apply to all Work throughout the Project. Requirements included in this Section are to apply to all other specification Sections.

1.3 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Center of...": Indicates a specific single point at the exact center of the tile, panel, or other surface indicated.
- D. "Contractor": The General Contractor unless otherwise stated.
- E. "Directed": A command or instruction by Architect, unless indicated as by Owner. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- H. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- I. "Project Manager": The Contractor's project manager.
- J. "Project Representative": The Owner's project representative(s).

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- K. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- L. "Provide": Furnish and install, complete and ready for the intended use.
- M. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- N. "Related Sections": Related Sections articles are included herein as a courtesy to assist in the locating of items in the specifications that the reader might expect to find in the Section but that are specified elsewhere. The list of sections may or may not be complete. 'Related Sections' articles do not relieve the Contractor of the contractual obligation to perform to all the Contract Documents or to coordinate who does what amongst the team of subcontractors.
- O. "Project Site": Location may be at the actual location where construction is taking place or may represent the SLCDA's Engineering Conference Room or other locations as determined by the owner.

1.4 SITE INSPECTION

- A. Examine the premises and site and compare them with the drawings and specifications.
- B. Become familiar with existing conditions such as obstructive areas, excavating or filling, and any problems related to construction. No allowances will subsequently be made by reason of failure to examine the site.
- C. The General Contractor is responsible for being aware of all required special inspections and for scheduling inspections with the owner.

1.5 SCOPE OF THE WORK

- A. See Division 01 Section 01 1000 "Summary" for an overall general summary of the Work.
- B. Unless otherwise provided, all materials, labor, equipment, tools, transportation, and utilities necessary for the successful completion of the Project shall be provided at the expense of the Contractor.
- C. Requirements of the Work are contained in the Contract Documents, and include cross-references herein to published information, which is not necessarily bound therewith.
- D. Provide and Install all Work so that its several component parts function together as a complete and workable system, and with all equipment properly adjusted and in working order.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- E. Conform to highest quality standards for materials and workmanship to execute Work that is indicated or specified and that is necessary to fully satisfy the Contract Document requirements for a complete, finished, acceptable installation regardless of whether indicated or specified or not.
- F. Responsibilities of the Contractor includes the responsibility to verify all field measurements of actual building conditions so that all Work fits properly in the locations indicated and specified. Protect existing structures, improvements, trees, and other items from physical damage, unless identified to be removed.
- G. Contractor is to restore roads, utilities, walks, curbs, gutters or other improvements belonging to the Owner, to the same condition as they existed prior to commencement of construction. Where said improvements are damaged, they shall be replaced by new Work to match existing adjacent Work, or repaired if acceptable to Project Representative, at no cost to Owner.
- H. Where there are conflicts that may exist between the contract documents the most stringent requirements shall govern.

1.6 WORKERS

- A. The Contractor is to enforce strict discipline and good order among his/her employees at all times and shall not employ on the Project any unfit person or anyone not skilled in the Work assigned to him/her.
- B. Consumption of alcohol, tobacco, or any other controlled, non-medically prescribed substance will not be allowed on the Project.
- C. Contractor shall rectify behavior unacceptable to the Owner or Owner's Project Representative by strict enforcement of discipline. Owner reserves the right to request dismissal of individual workers for failure to comply with standards of behavior communicated to the Contractor.

1.7 TAXES

- A. The Contractor shall pay sales, use, payroll, unemployment, old age pension, or surtax applicable to this project.
- B. The Owner shall pay taxes and assessments on real property comprising the site of this project.

1.8 MANUFACTURER'S DIRECTIONS

- A. Manufactured articles, materials, or equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the Manufacturer's printed directions unless otherwise indicated in the Contract Documents.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.9 FASTENERS

- A. Unless noted otherwise, the trade requiring the fastening of its Work to any substrate or support is responsible for provision and installation of requisite fasteners.

1.10 PENETRATIONS

- A. The sealing of all penetrations in fire-rated, acoustically-rated or structural partitions and separations is the responsibility of the trade making or requiring the penetration.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011010

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1.2 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Work restrictions.
5. Specification and drawing conventions.

1.4 PROJECT INFORMATION

A. Project Identification: INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 South State Street
Salt Lake City, Utah

1. Facility Manager:

Steve Rose
36 S. State Street Suite 2300
Salt lake City, Utah 84111
Off: 801.422.2861
Cell: 801.850.1142
steve.rose@imail.org

B. Architect: ajc architects; Justin Heppler; 1.801.466.8818

C. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. MECHANICAL ENGINEERING

SPECTRUM ENGINEERING
324 South State Street, Suite 400
Salt Lake City, Utah 84111
1.801.328.5151
Contact: Ryan Boogaard

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

4. ELECTRICAL ENGINEERING

SPECTRUM ENGINEERING
324 South State Street, Suite 400
Salt Lake City, Utah 84111
1.801.328.5151
Contact: Tyler Squire

1.5 WORK COVERED BY CONTRACT DOCUMENTS

Description of:

KBT 22

This project consists of a 16,285 SF interior tenant improvement to level 22 in the Key Bank Tower in downtown Salt Lake City. The existing floor will be entirely demolished with the exception of the building common core elements. New office environments for the Executive Leadership Team and the Executive Legal Team will be provided that consist of open office areas, meeting/collaboration areas, a break room and storage spaces. The construction is type I-A, the new HVAC will be dependent on the existing head end systems.

WTC 19

This project consists of a 14,635 SF interior tenant improvement to level 19 in World Trade Center in downtown Salt Lake City. The existing floor will be entirely demolished with the exception of the building common core elements. New office environments will be provided that consist of open office areas, meeting/collaboration areas, a break room and storage spaces. The construction is type I-A, the new HVAC will be dependent on the existing head end systems.

A. Type of Contract:

1. Project will be constructed under a single prime contract.

1.6 WORK UNDER SEPARATE CONTRACTORS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other Contracts. Coordinate the Work of this Contract with Work performed under separate contracts.

B. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1. Interior Signage.

1.7 PURCHASE CONTRACTS

- A. General: Owner has negotiated purchase contracts with suppliers of material and equipment to be incorporated into the Work. Owner will assign these purchase contracts to Contractor. Include costs for purchasing, receiving, handling, storage if required and installation of material and equipment in the Contract Sum, unless otherwise indicated.
 - 1. Contractor's responsibilities are same as if Contractor had negotiated purchase contracts, including responsibility to renegotiate purchase and to execute final purchasing agreements.
- B. Purchase Contracts Information:
 - 1. Purchase Contracts Information:
 - a. Purchase Contract Firm and Representative: Mannington
 - b. Purchase Contract Scope: Resilient Flooring
 - c. Purchase Status: Price negotiated by Owner, to be incorporated in the Contract Sum by Contractor.

1.8 OWNER-FURNISHED, OWNER-INSTALLED (OFOI) PRODUCT

- A. The specific product is not in this contract and actual installation of the product will be made by the Owner.
- B. Products will be indicated as follows:
 - 1. Product prefixed with "Space for".
 - 2. N.I.C.
 - 3. Owner Furnished – Owner Installed.
 - 4. Product noted as "Future".
- C. Rough-in for Owner-Furnished, Owner Installed product is provided by applicable sections governing the type of work. Obtain rough-in requirements from Owner.

1.9 OWNER-FURNISHED, CONTRACTOR-INSTALLED (OFCI) PRODUCT

- A. Install products indicated as follows:
 - 1. "Owner Furnished, contractor Installed".
 - 2. "Reuse".
 - 3. "relocate"
- B. Provide labor, transportation, materials, tools appliances and utilities necessary for the following:
 - 1. Relocated Products:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Removing installed product from the Owner's existing facility, as required.
 - b. Transportation of product from Owner's facility to the job site.
2. Receiving and storage of Owner furnished, Contractor installed product, as required.
 3. Providing materials and components for the product as necessary to install in an operating condition but not including repairing of existing damages to the product.
 4. Modification of product only as specified under the particular item.
 5. Installation of product in this project, complete and in operating condition, including the adjusting and calibration of the product as necessary for proper operation.
 6. Testing of product.
 7. Paying of fees, licenses, and taxes in conjunction with the installation of the product.
 8. Roughing-in and final utility connections for the Owner furnished, Contractor installed product remains the work of Sections governing the specific utility.

1.10 ACCESS AND USE TO/OF SITE

- A. General: Contractor shall have limited use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated.
- C. Ensure that exits provide free and unobstructed egress.
- D. Prohibit smoking in or adjacent to all construction areas.
- E. Develop and enforce storage, housekeeping and debris-removal practices.
- F. Confine constructions operations to work in areas indicated on drawings.
- G. Allow for Owner occupancy of site and use by the public.
- H. Keep driveways and entrances serving premises clear and available to Owner, other tenants, and emergency vehicles at all times.
- I. Do not use drives and entrances for parking or storage of materials.
- J. Assume full responsibility for the protection and safekeeping of Products under this Contract, stored on the site.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- K. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period, Repair damage caused by construction operations.

1.11 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of Monday through Friday, unless otherwise indicated, or agreed by the Owner.
 - 1. Weekend Hours: As coordinated with Owner.
 - 2. Early Moring Hours: As coordinated with Owner.
 - 3. Hours for Utility Shutdowns: As coordinated with Owner.
 - 4. Hours for noisy activities: As coordinated with Owner.
- C. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption.
 - 1. Notify Owner not less than 72 hours in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- D. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.12 LIMITED OCCUPANCY OF COMPLETED AREAS OF CONSTRUCTION

- A. Owner reserves the right to occupy and to place and install equipment I completed portions of the work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the completed work.

1.13 WORKER CONDUCT AND APPEARANCE – WORK RULES

- A. General: the conduct and appearance of each worker at the jobsite is of paramount importance. The Owner reserves the right to require any worker to be removed from the project site.
 - 1. Conduct and Demeanor: construction workers shall treat other construction workers, Other tenants and visitors professionally with respect and courtesy.
 - 2. Tobacco Products; The use of tobacco products is prohibited.
 - 3. Language: the use of foul language is prohibited.
 - 4. Sexual Harassment: All forms of physical and verbal sexual harassment including, without limitation: touching, whistling, sexually explicit stories, jokes, drawings,

photos and representations, exhibitionism and all other sexually oriented offensive behavior is prohibited.

- B. Warnings and Dismissal: For minor infraction of the rules, only one warning will be allowed per worker. Second infraction shall result in immediate dismissal of the worker from the project site.
- C. Clearly notify and educate each worker about these work rules.

1.14 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. 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.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products may be identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
 - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012500 - SUBSTITUTION PROCEDURES

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 administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. 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 product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions 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. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. 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 date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. 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 5 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within **15** days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 - 1. 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:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. 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.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
 - 1. 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:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. 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.
- b. Requested substitution does not require extensive revisions to the Contract Documents.
- c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- d. Substitution request is fully documented and properly submitted.
- e. Requested substitution will not adversely affect Contractor's construction schedule.
- f. Requested substitution has received necessary approvals of authorities having jurisdiction.
- g. Requested substitution is compatible with other portions of the Work.
- h. Requested substitution has been coordinated with other portions of the Work.
- i. Requested substitution provides specified warranty.
- j. 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.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500



SUBSTITUTION REQUEST (After the Bidding Phase)

Project:
To:
Re:
Substitution Request Number:

From:
Date:
A/E Project Number:
Contract For:

Specification Title:
Section: Page:
Description:
Article/Paragraph:

Proposed Substitution:
Manufacturer: Address: Phone:
Trade Name: Model No.:
Installer: Address: Phone:
History:
Differences between proposed substitution and specified product:

Point-by-point comparative data attached - REQUIRED BY A/E

Reason for not providing specified item:

Similar Installation:
Project: Architect:
Address: Owner:
Date Installed:

Proposed substitution affects other parts of Work: No Yes; explain

Savings to Owner for accepting substitution: (\$):

Proposed substitution changes Contract Time: No Yes [Add] [Deduct] days.

Supporting Data Attached: Drawings Product Data Samples Tests Reports

REQUEST
(Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments: _____

A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01330.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by:

Date:

Additional Comments: Contractor Subcontractor Supplier Manufacturer A/E _____

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

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 administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the 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 Architects Form HKS-710 "Architect's supplemental Instructions"; copy attached at the end of this Section.

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 using Architect's Form HKS-709 "Proposed Change"; copy attached at the end of this Section. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposed Changes issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or with reasonable promptness, when not otherwise specified, after receipt of Proposal change, 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 applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- d. 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.
 - e. Include up-dated submittal schedule showing effect of the change.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to the Architect using Contractor's Form.
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 costs of labor and supervision directly attributable to the change.
 5. 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.
 6. Include up-dated Schedule(s) showing effect of the change.
 7. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance adjustment: If applicable, see Division 01 section "Allowances" for administrative procedures for preparation of Proposed Change for adjusting the Contract sum to reflect actual costs of allowances.
- B. Unit Price adjustment: If applicable, see Division 01 Section "Unit Prices" for administrative procedures for preparation of Proposed Change for adjusting the Contract Sum to reflect measured scope of unit-price work.
- C. Alternates: If applicable, see Division 01 section "Alternates" for administrative procedures for preparation of Proposed Change for adjusting the Contract Sum to reflect measured scope of alternate work.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposed Change, Architect will issue a Change Order for signatures of Owner and Contractor on Architects form HKS-701 "Change Order"; copy attached at the end of the section.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on HRS-714 "Construction Change Directive"; copy attached at the end of this section. 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 012600

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 012900 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

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. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Accepted Alternates.
 - 2. 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Format and Content: Use 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 schedule of values consistent with format of AIA Document G703 or form acceptable to Owner and Architect.
 3. 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 of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents.
 - a. Include separate line items under principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 6. 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. If required, include evidence of insurance or bonded warehouse.
 7. 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

8. Provide a separate line item in the schedule of values for each allowance, for each alternative, for each change order, for each purchase contract; if applicable.
9. 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.
10. 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 ARCHITECTS COST DATA

- A. In addition to the Schedule of Values, submit itemized cost data reporting on AIA for G-757 "Project Cost Summary"; copy attached at the end of this Section. Initial submission shall be included with contractor's first Application for Payment. Final updated submission shall be included with contractor's final Application for Payment.

1.6 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial 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.
 1. If the Agreement does not state payment dates, establish dates at preconstruction conference.
 2. Submit draft, or pencil, copy of Application for Payment seven days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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. Stored Materials: If accepted by Owner, Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit three signed and notarized original copies 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.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waver Delays: Submit each Application for Payment with Contractor's Waver of mechanic's lien for construction period covered by the application.
 - a. Submit final application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 5. Products list (preliminary if not final).
 6. Submittal schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After Architect issues 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 and a statement showing an accounting of changes to the Contract Sum.
 2. When Applicable, This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts. and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. If applicable, Final liquidated damages settlement statement.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 013100 - 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 Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

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

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project meetings.

- B. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. Project communications documents shall be defined as the following:

1. Letters.
2. Memoranda.
3. E-Mail communications / Internet Communications / Project Management Software Communications.
4. RFI (Request for Information – Contractor).
5. RFI-A (Request for Information – Architect).

1.4 FORMAT

- A. Letters and Memoranda: Submit in formats acceptable to the Architect.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. I-Mail Communications / Internet Communications / Project Management Software Communications: Submit in forms and formats acceptable to and as approved by the Architect.
- C. RFI (Request for Information – Contractor): Submit on forms furnished by the Architect, or on other forms as approved by the Architect. Unless otherwise approved use Ala form G-750, Request for information “Request for Information”; Copy attached at the end of this Section.
- D. RFI-A (Request for Information – Architect), Will be submitted by Architect to Contractor on Architects standard form.

1.5 PROJECT COMMUNICATIONS DOCUMENTS

- A. Letters and Memoranda documents shall be submitted in a timely manner so as to facilitate project delivery and coordination. Routing of communications shall be as established in the Contract, The Contract documents and the Pre-Construction Conference. Communications documents shall be transmitted or forwarded in a manner consistent with the schedule and progress of the work.
- B. E-Mail Communications, Internet Communications and Project Management Software programs must be compatible with the Architect's and Owner's computer systems and equipment. The responsibility for all costs for management of these systems, including but not limited to, licensing, onsite training or other training necessary for the proper operation of such systems, shall be by the Contractor. The Contractor shall keep written records and hard file copies of all electronic communications. Failure of the Contractor to keep such records shall waive the Contractor's right to rely on such communications and such communications shall be deemed to have not taken place.
- C. RFI (Request for Information – Contractor) shall be defined and limited to a request from the Contractor seeking interpretation or clarification of the requirements of the Contract Documents. Such requests shall comply with the following requirements:
 - 1. RFI requests shall be submitted in a timely manner, well in advance of related work, and allow sufficient time for the resolution of issues relating to the request for interpretation or clarification. RFI's shall be submitted in a manner consistent with the schedule and progress of the work, and shall not be submitted in a sporadic and/or excessive manner.
 - 2. RFI requests shall be numbered in a sequential manner and contain a detailed description of the areas of work requiring interpretation or clarification. Include drawing and specification references, sketches, technical data, brochures or other supporting data as deemed necessary by the Architect, for the Architect to provide the interpretations and clarifications requested.
 - a. The Contractor shall include a “Proposed Solution” to the issue requiring interpretation or clarification.

3. RFI's submitted to the Contractor by Sub-Contractors, vendors, suppliers or other parties to the work shall be reviewed by the Contractor prior to submission to the Architect. If the Architect deems that such RFI requests have not been adequately reviewed by the Contractor, such requests will be returned to the Contractor for further action. Sub-Contractor's RFI shall contain a "Proposed Solution".
4. RFI requests are limited to a request for interpretation or clarification of the requirements of the Contract Documents. Interpretations provided by the Architect shall not change the requirements of the Contract or the Contract Documents. If the Contractor determines that the Architect's response to an RFI gives cause for a charge in the Contract or the Contract Documents, the Contractor shall promptly, within 5 working days, give written notice to the Architect of request for adjustments. Requests for adjustments to the Contract shall be submitted in a manner consistent with the terms and conditions of the Contract Documents.
5. RFI's requests are limited to a request for interpretation or clarification of the requirements of the Contract Documents. Interpretations provided by the Architect shall not change the requirements of the Contract or the Contract Documents. If the Contractor determines that the Architect's response to an RFI gives cause for a change in the Contract or the Contract Documents, the Contractor shall promptly, within 5 working days, give written notice to the Architect of request for adjustments. Requests for adjustments to the Contract shall be submitted in a manner consistent with the terms and conditions of the Contract Documents.
6. If the Architect, after review, determines that any RFI has been submitted in an incomplete manner, is unnecessary or does not otherwise comply with the requirements of this section, the RFI will be returned without action to the Contractor. The Contractor shall delete the original submittal date from the RFI log and enter a new submittal date at the time of re-submittal.
7. RFI Log: Prepare, maintain and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of Project Web site. Software log with not less than the following:
 - a. Project name.
 - b. Name and address of Contractor.
 - c. Name and address of Architect.
 - d. RFI number including RFIs that were returned without action or withdrawn.
 - e. RFI description.
 - f. Date the RFI was submitted.
 - g. Date Architect's response was received.
8. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
 - a. Identification of related Minor Change in the Work, Construction Change Directive and Proposal Request, as appropriate.

- D. RFI-A (Request for Information – Architect) shall be defined as a request by the Architect for information relating to the obligations of the Contractor under the Contract.
 - 1. After receipt of an RFI-S the Contractor shall provide a written response to the Architect within 5 working days. Responses shall be thorough, complete and shall contain all information requested by the Architect.
 - 2. An RFI-A shall be limited to a request by the Architect for information related to the project. The RFI-A shall not be construed as authorizing or directing a change in the Contract or the Contract Documents.
- E. Revisions to Contract Documents: Responses to requests for information (RFI) shall not serve as construction documents; and the Contractor shall not incorporate RFI responses into construction of the Project, unless such answers bear the seal and signature of a licensed design professional, and has not increase or reduced the contract sum or contract time.

1.6 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.7 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.8 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections elevations, and details as needed to describe relationship of various systems and components.
 - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical and electrical systems.
 - c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.

- d. Show location and size of access doors required for access to concealed dampers, valves and other controls.
 - e. Indicate required installation sequences.
 - f. Indicate dimensions shown on the drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version and operating system as original drawings.
 2. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
 3. BIM File incorporation: When applicable, develop coordination drawing files from Building Information Model (BIM) established for Project.
 - a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
 4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: drawings are available in AutoDesk Revit and/or Autocad; and compatible with Microsoft Windows operating system.
 - c. Contractor shall execute a data licensing agreement using the Architects standard form; see copy at the end of the section.

1.9 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: Construction Manager / General Contractor will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, General Contractor and Architect, within three days of the meeting.

4. Attendance: Document attendance of all participants.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction.
1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration and coordination with adjacent activities. Prepare agenda appropriate to work.
 3. Record significant conference discussions, agreements and disagreements, including required corrective measures and actions.
 4. Reporting: distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 60 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.

- d. If applicable, requirements for completing sustainable design documentation.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for delivery of material samples, attic stock, and spare parts.
 - g. Requirements for demonstration and training.
 - h. Preparation of Contractor's punch list.
 - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - j. Submittal procedures.
 - k. If applicable, Coordination of separate contracts.
 - l. If applicable, Owner's partial occupancy requirements.
 - m. Installation of Owner's furniture, fixtures, and equipment.
 - n. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at weekly intervals or as defined by Architect and Owner.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) If applicable, resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) If applicable, status of sustainable design documentation.
 - 6) Deliveries.
 - 7) Off-site fabrication.
 - 8) Access.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 9) Site utilization.
 - 10) Temporary facilities and controls.
 - 11) Work hours.
 - 12) Hazards and risks.
 - 13) Progress cleaning.
 - 14) Quality and work standards.
 - 15) Status of correction of deficient items.
 - 16) Field observations.
 - 17) Status of RFIs.
 - 18) Status of proposal requests.
 - 19) Pending changes.
 - 20) Status of Change Orders.
 - 21) Pending claims and disputes.
 - 22) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - 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.
- F. Coordination Meetings: Conduct Project coordination meetings on an as-needed basis. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and reinstallation conferences.
1. Attendees: Each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review items of significance that could affect progress, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) If applicable, resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site utilization.
 - 9) Temporary facilities and controls.
 - 10) Work hours.
 - 11) Hazards and risks.
 - 12) Progress cleaning.
 - 13) Quality and work standards.
 - 14) Change Orders.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

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 administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Construction schedule updating reports.
 - 3. Daily construction reports.
 - 4. Material location reports.
 - 5. Site condition reports.
 - 6. Special reports.
- B. Related Requirements:
 - 1. Section 011000 "Summary".
 - 2. Section 013300 "Submittal Procedures" for submitting schedules and reports.
 - 3. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
 - 3. Two paper copies, one copy for the Owner and the other copy for the Architect.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- C. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.
 - 4. Earnings Report: Compilation of Contractor's total earnings from **the Notice to Proceed** until most recent Application for Payment.
- D. Construction Schedule Updating Reports: Submit with Applications for Payment.
- E. Daily Construction Reports: Submit at monthly intervals, provide with application for payment.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- F. Material Location Reports: Submit at monthly intervals, provide with application for payment.
- G. Site Condition Reports: Submit at time of discovery of differing conditions.
- H. Special Reports: Submit at time of unusual event.

1.5 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion; show date of substantial completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Where Applicable, Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 4. Startup and Testing Time: Include no fewer than 7 days for startup and testing, where applicable.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 - 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner, if any.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Utility services.
 - c. Partial occupancy before Substantial Completion.
 - d. Provisions for future construction.
 - e. Seasonal variations.
 - f. Environmental control.
 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and Contract Time.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 STARTUP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 30 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 20 days of date established for the Notice to Proceed. Base schedule on the startup construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

- B. Material Location Reports: At monthly intervals, prepare and submit 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. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner and Architect 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 and Architect in advance when these events are known or predictable.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule each month at the regularly scheduled progress meeting for first of each months progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.

- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules 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 performance of construction activities.

END OF SECTION 013200

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Periodic construction photographs.
 - 3. Final completion construction photographs.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting photographic documentation.
 - 2. Section 017700 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
 - 3. Section 024116 "Structure Demolition"
 - 4. Section 310000 "Site Clearing" for photographic documentation before site clearing operations commence.

1.3 INFORMATIONAL SUBMITTALS

- A. Digital Photographs: Submit image files within three days of taking photographs.
 - 1. Digital Camera: Minimum sensor resolution of 8 megapixels.
 - 2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
 - 3. Identification: Provide the following information with each image description in file metadata tag:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - g. Unique sequential identifier keyed to accompanying key plan.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.4 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.
- B. Web-Based Photographic Documentation Service Provider: A firm specializing in providing photographic equipment, Web-based software, and related services for construction projects, with record of providing satisfactory services similar to those required for Project.

1.5 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.
- B. Digital Video Recordings: Provide optional high-resolution, digital video disc in format acceptable to Architect.

2.2 WEB-BASED PHOTOGRAPHIC DOCUMENTATION (Optional)

- A. Project Camera: Provide fixed exterior camera installation, mounted to provide unobstructed view of construction site from location approved by Architect.
 - 1. Provide one or two fixed-location camera(s), with the following characteristics:
 - a. Static view.
 - b. Capable of producing minimum 3.0 megapixel pictures.
 - c. Provide power supply, active high-speed data connection to service provider's network, and static public IP address for each camera.
- B. Web-Based Image Access: Password-protected access for Project team administered by Contractor, providing current image access and archival image access by date and time, with images downloadable to viewer's device.
 - 1. Provide public viewer open access to most recent project camera image.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Provide a qualified photographer to take construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in file name for each image.
 - 2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.
- D. Preconstruction Photographs: Before commencement of excavation, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
 - 1. Flag excavation areas and construction limits before taking construction photographs.
 - 2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
 - 3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- E. Periodic Construction Photographs: Take **20** photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- F. Architect-Directed Construction Photographs: From time to time, Architect will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.
- G. Final Completion Construction Photographs: Take 20 color photographs after date of Substantial Completion for submission as project record documents. Architect will inform photographer of desired vantage points.
 - 1. Do not include date stamp.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- H. Additional Photographs: Architect or Owner may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.
1. Three days' notice will be given, where feasible.
 2. In emergency situations, take additional photographs within 24 hours of request.
 3. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Special events planned at Project site.
 - b. Immediate follow-up when on-site events result in construction damage or losses.
 - c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
 - d. Substantial Completion of a major phase or component of the Work.
 - e. Extra record photographs at time of final acceptance.
 - f. Owner's request for special publicity photographs.

3.2 CONSTRUCTION VIDEO RECORDINGS (Optional)

- A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings.
- B. Recording: Mount camera on tripod before starting recording unless otherwise necessary to show area of construction. Display continuous running time and date. At start of each video recording, record weather conditions from local newspaper or television and the actual temperature reading at Project site.
- C. Preconstruction Video Recording: Before starting excavation, record video recording of Project site and surrounding properties from different vantage points, as directed by Architect.
1. Flag excavation areas and construction limits before recording construction video recordings.
 2. Show existing conditions adjacent to Project site before starting the Work.
 3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of excavation. Show protection efforts by Contractor.
- D. Periodic Construction Video Recordings: Record optional video recording weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last video recordings were recorded. Minimum recording time shall be **30** minutes(s).

3.3 WEB-BASED CONSTRUCTION PHOTOGRAPHIC DOCUMENTATION (Optional)

- A. Live Streaming Construction Site Images: Provide Web-accessible image of current site image from fixed location camera(s), updated at 15 minute intervals during daytime operation.
- B. Time-Lapse Sequence Construction Site Recordings: Provide video recording from a fixed-location camera to show status of construction and progress.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Frequency: Record one frame of video recording every 15 minutes, from same vantage point each time, to create a time-lapse sequence of construction activities.
 2. Timer: Provide timer to automatically start and stop video recorder so recording occurs only during daylight construction work hours.
- C. Maintain cameras and Web-based access in good working order according to Web-based construction photographic documentation service provider's written instructions until final completion. Provide for service of cameras and related networking devices and software.

END OF SECTION 013233

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 013300 - SUBMITTAL PROCEDURES

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.
- B. Related Sections:
 - 1. Division 01 Section "Construction Progress and Documentation" for preparing and submitting Contractor's construction schedule.

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for electronically submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections:
 - 1. Division 01 Section "Payment Procedures" for submitting electronic Applications for Payment and the schedule of values.
 - 2. Division 01 Section "Construction Progress and Documentation" for submitting electronic schedules and reports, including Contractor's construction schedule.
 - 3. Division 01 Section "Project Record Documents" for submitting electronic record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals. All action submittals to be electronically transmitted to Architect's FTP site.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as informational submittals. All informational submittals to be electronically transmitted to Architect's FTP site.
- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit an electronic schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action, informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled dates for installation.
 - i. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Electronic Submittals: All submittals are to be transmitted electronically to Architect. No hard copies will be accepted or processed, other than samples and products.
- B. Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings may be provided, upon request and receipt of ajc architects Intellectual Property Right release form, for Contractor's use in preparing submittals.
1. Owner may furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in Revit only.
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Contractor through Architect.
- E. Identification and Information: Place a permanent label or title block on each electronic submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 2 by 4 inches (50 by 100 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of subcontractor.
 - d. Name of supplier.
 - e. Name of manufacturer.
 - f. Submittal number or other unique identifier, including revision identifier.
- 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- g. Number and title of appropriate Specification Section.
 - h. Drawing number and detail references, as appropriate.
 - i. Location(s) where product is to be installed, as appropriate.
 - j. Other necessary identification.

- F. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:
 - 1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LSP-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LSP-061000.01.A).
 - 3. Provide means for insertion to permanently record review and approval markings and action taken by Architect.
 - 4. Include the following information on an inserted electronic cover sheet:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of General Contractor.
 - e. Name of firm or entity that prepared submittal.
 - f. Name of subcontractor.
 - g. Name of supplier.
 - h. Name of manufacturer.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Related physical samples submitted directly.
 - m. Other necessary identification.
 - 5. Include the following information as keywords in the electronic file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.

- G. Options: Identify options requiring selection by the Architect on Cover Sheet.

- H. Deviations: Identify deviations from the Contract Documents on submittals on Cover Sheet.

- I. Transmittal: Assemble each submittal individually and appropriately for electronic transmittal and handling. All portions, segments, and sections of each submittal shall be collated into one package. Transmit each submittal using electronic transmittal form. Architect will electronically return submittals, without review, received from sources other than General Contractor.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Electronic Transmittal Form: Use AIA Document G810, or Transmittal form acceptable to Owner.
 2. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Indication of full or partial submittal.
 - j. Drawing number and detail references, as appropriate.
 - k. Transmittal number, numbered consecutively.
 - l. Submittal and transmittal distribution record.
 - m. Remarks.
 - n. Signature of transmitter.
 3. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- J. Resubmittals: Make resubmittals in same form as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- K. Distribution: Furnish electronic copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- L. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.
- M. Job Site: Provide and have available at the job site, one hard copy of architect's action stamped submittal.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Electronic Submittal Procedure Requirements: Prepare and submit electronic submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Action Submittals: Submit electronic copies of each submittal, unless otherwise indicated. Architect will electronically return reviewed electronic copies.
 2. Informational Submittals: Submit electronic copies of each submittal, unless otherwise indicated. Architect will not return copies.
 3. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
 4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 5. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Product Data: Collect information into a single electronic submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each electronic submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. Electronic copies of Product Data, unless otherwise indicated. Architect will return electronic copies.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based upon Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
2. Submit Shop Drawings in the following format:
 - a. Electronic copies of each submittal. Architect and engineer will return reviewed electronic copy.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Electronic color selections may be used where appropriate.
 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal Contractor with options selected.
 5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing

color, texture, and pattern; color range sets; and components used for independent testing and inspection.

- a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a Project record sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

- E. Product Schedule: As required in individual Specification Sections, prepare a written summary, electronically transmitted, indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product indicated in the Contract Documents.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
 5. Submit product schedule in the following format:
 - a. Electronic copies of product schedule or list, unless otherwise indicated. Architect will return electronic copies.

- F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress and Documentation." Submit electronically.

- G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures." Submit electronically.

- H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures." Submit electronically.

- I. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination." Submit electronically.

- J. Qualification Data: Prepare written information, electronically transmitted, that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

- K. Welding Certificates: Prepare written certification, electronically transmitted, that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- L. Installer Certificates: Submit written statements, electronically transmitted, on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- M. Manufacturer Certificates: Submit written statements, electronically transmitted, on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- N. Product Certificates: Submit written statements, electronically transmitted, on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- O. Material Certificates: Submit written statements, electronically transmitted, on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- P. Material Test Reports: Submit reports, electronically transmitted, written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- Q. Product Test Reports: Submit written reports, electronically transmitted, indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- R. Research Reports: Submit written evidence, electronically transmitted, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- S. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."
- T. Preconstruction Test Reports: Submit electronically transmitted reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- U. Compatibility Test Reports: Submit electronically transmitted reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- V. Field Test Reports: Submit electronically transmitted reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- W. Maintenance Data: Comply with requirements specified in APWA Manual referenced in Division 01 General Requirements and Division 01 Sections "Project Closeout" and "Operation and Maintenance Data". All Maintenance Data to be electronically transmitted.
- X. Design Data: Prepare and submit electronically transmitted written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- 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 electronically transmitted 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 electronic 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.
 - 2. Delegated Design Engineer's are to be licensed in the State of Utah.

PART 3 - EXECUTION

3.1 GENERAL CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before electronically submitting to Architect.
- B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include name of reviewer, date of Contractor's approval. Stamp submittal shall indicate Contractor's review has been completed, and that the submittal has been reviewed, and checked for compliance with the Contract Documents.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3.2 OWNER'S REVIEW

- A. Action and Informational Submittals: Provide required electronic submittals for Owner's Review including local Fire Marshal authority and Owner's Insurer.

3.3 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear General Contractor's approval stamp and will electronically return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and electronically return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
 - 1. REVIEWED.
 - 2. REVISE AND RESUBMIT.
 - 3. FURNISH AS CORRECTED.
 - 4. REJECTED.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it electronically if it does not comply with requirements. Architect will electronically forward each submittal to appropriate design team party.
- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned electronically without review.
- F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK



SUBMITTAL TRANSMITTAL

Project: _____

Date: _____
A/E Project Number: _____

TRANSMITTAL A To (Contractor): _____
From (Subcontractor): _____

Date: _____ Submittal No. _____
By: _____ Resubmission

Qty.	Reference / Number	Title / Description / Manufacturer	Spec. Section Title and Paragraph / Drawing Detail Reference

- Submitted for review and approval
- Resubmitted for review and approval
- Complies with contract requirements
- Will be available to meet construction schedule
- A/E review time included in construction schedule

- Substitution involved - Substitution request attached
- If substitution involved, submission includes point-by-point comparative data or preliminary details
- Items included in submission will be ordered immediately upon receipt of approval

Other remarks on above submission: _____ One copy retained by sender

TRANSMITTAL B To (A/E): _____
From (Contractor): _____

Attn: _____ Date Rec'd by Contractor: _____
By: _____ Date Trnsmt'd by Contractor: _____

- Approved
- Approved as noted

- Revise / Resubmit
- Rejected / Resubmit

Other remarks on above submission: _____ One copy retained by sender

TRANSMITTAL C To (Contractor): _____
From (A/E): _____ Other

Attn: _____ Date Rec'd by A/E: _____
By: _____ Date Trnsmt'd by A/E: _____

- Approved
- Approved as noted
- Not subject to review
- No action required
- Revise / Resubmit
- Rejected / Resubmit
- Approved as noted / Resubmit

- Provide file copy with corrections identified
- Sepia copies only returned
- Point-by-point comparative data required to complete approval process
- Submission Incomplete / Resubmit

Other remarks on above submission: _____ One copy retained by sender

TRANSMITTAL D To (Subcontractor): _____
From (Contractor): _____

Attn: _____ Date Rec'd by Contractor: _____
By: _____ Date Trnsmt'd by Contractor: _____

Copies: Owner Consultants _____ _____ _____ One copy retained by sender



AGREEMENT CONCERNING DRAWING FILES ON ELECTRONIC MEDIA-CONTRACTOR

At your request, we will provide electronic files for your convenience and use for the project, subject to the following terms and conditions:

Our electronic files (BIM model or other CAD files) are compatible with REVIT 20__ or AutoCAD 20__. We make no representation as to the compatibility of these files with your hardware or your software beyond the specified release of the referred specifications.

Data contained on these electronic files are part of our instruments of service and shall not be used by you or anyone else receiving these data through or from you for any purpose other than as a convenience for the referenced project. Any other use or reuse by you or by others will be at your sole risk and without liability or legal exposure to ajc architects and the consulting engineers for this project. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against us, our officers, directors, employees, agents or subconsultants that may arise out of or in connection with your use of the electronic files.

Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold us harmless against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising out of or resulting from your use of these electronic files.

These electronic files are not construction documents. Differences may exist between these electronic files and corresponding hard-copy construction documents. We make no representation regarding the accuracy or completeness of the electronic files you receive. Revit models may not include all design elements necessary for completing the project. In the event that a conflict arises between the signed or sealed hardcopy construction documents prepared by ajc architects and consulting engineers, and the electronic files, the signed or sealed hard-copy construction documents shall govern. You are responsible for determining if any conflict exists. By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with that of other contractors for the project.

Because information presented on the electronic files can be modified, unintentionally or otherwise, all title blocks, and other references to ajc architects, our consulting engineers and the owner(s) shall be removed. If used as submittal documents, submittals will be rejected if non-compliant.

Under no circumstances shall delivery of the electronic files for use by you be deemed a sale by us, and we make no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall we be liable for any loss of profit or any consequential damages as a result of your use or reuse of these electronic files. The drawings files provided by ajc architects and consulting engineers may not be reproduced or distributed to individuals outside the company or collective organization signing this agreement.

Project Name: _____
ajc architects Project Number: _____
List of Revit Models: _____
List of CAD Files: _____

Contractor: _____
Contractor Representative: _____
Signature: _____
Date: _____

THIS PAGE IS INTENTIONALLY LEFT BLANK

ajc architects

703 east 1700 south
salt lake city, utah 84105
ph: 801.466.8818
fx: 801.466.4411
www.ajcarchitects.com
2 of 2 pages

SECTION 014000 - QUALITY REQUIREMENTS

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 administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction and with the qualification requirements of individual specification sections governing their work.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.5 ACTION SUBMITTALS

- A. Shop Drawings: For mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.7 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. **Manufacturer Qualifications:** A firm experienced in manufacturing products or systems 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.
- C. **Fabricator Qualifications:** A firm experienced in producing products 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.
- D. **Installer Qualifications:** A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. **Specialists:** Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. **Testing Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. **Manufacturer's Technical Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. **Factory-Authorized Service Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. **Preconstruction Testing:** Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.
 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow up to seven days for initial review and each re-review of each mockup.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Demolish and remove mockups when directed unless otherwise indicated.

1.9 QUALITY CONTROL

- A. Owner Responsibilities: Owner will engage (where required) a qualified testing agency to perform these services.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
 3. The Owner will contract with a vendor to provide the third-party testing and inspection of:
 - a. Concrete compressive strength testing.
 - b. Fireproofing thickness/adhesion, density.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 4. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 5. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.
- J. Distribution: Distribute schedule to Owner, Architect, testing agencies and each party involved in performance of portions of the Work where tests and inspections are required.
1. Prepare in tabular form and include the following:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Specification Section number and title.
- b. Entity responsible for performing tests and inspections.
- c. Description of test and inspection.
- d. Identification of applicable standards.
- e. Identification of test and inspection methods.
- f. Number of tests and inspections required.
- g. Time schedule or time span for tests and inspections.
- h. Requirements for obtaining samples.
- i. Unique characteristics of each quality-control service.

1.10 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification and as follows:
 1. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 2. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 3. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 4. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 5. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
 - 1. Cost or use charges for temporary facilities are not chargeable to Owner or Architect.
- B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 - 3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- D. Dust and HVAC Control Plan: submit coordination drawing and narrative that indicates the dust and HVAC control measures proposed for use, proposed locations and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system insulation schematic drawing.
 - 3. Location of proposed air-filtration system discharge.
 - 4. Waste handling procedures.
 - 5. Other dust-control measures.

1.5 QUALITY ASSURANCE

- A. Standards: Comply with ANSI A10.6 "Requirements for Demolition Operations", NECA's "Temporary Electrical Facilities", and NFPA 241 "Standard for Safeguarding Construction, Alteration and Demolition Operations".
- B. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- C. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- D. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- E. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to, the following:
 - 1. Building Code requirements.
 - 2. Health and safety regulations.
 - 3. Utility company regulations.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

4. Police, Fire Department and Rescue Squad rules.
5. Environmental protection regulations.
6. City Ordinances and regulations.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.
- B. Materials and equipment may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions and must not violate requirements of applicable codes and standards.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 6 mil minimum thickness, with Class A flame-spread rating per ASTM E84 and passing NFPA 701 Test Method 2.
 1. Basis of Design (Product Standard): Abatement Technologies, Inc.; SAFE-FLEX ICRA Awareness Barrier.
- D. Dust Containment Barrier for Doors: reinforced, fire-resistive polyethylene sheet, 10 mil minimum thickness with Class B flame-spread rating per ASTM E84 and designed to be used for securing temporary construction doors so as to minimize and mitigate particle control during construction.
 1. Basis of design (Product Standard): Abatement Technologies, Inc.; Aire Guardian Door Guard Reusable Barrier.
- E. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.
- F. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
 - 3. Drinking water and private toilet.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
 - 6. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent and size required by location and class of fire exposure.
- B. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- C. Drinking-Water Fixtures: containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.
- D. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures".

- E. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction. Sterilize temporary water piping before use in accordance with requirements of authorities having jurisdiction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Existing Toilets in Occupied Facilities: Use of Owner's existing toilet facilities will not be allowed.
- E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select

equipment that will not have a harmful effect on completed installations or elements being installed.

- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction and continuing until removal of temporary partition is complete.
 - 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 - 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
 - 1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- J. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
- K. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.
 - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Coordinate parking with Owner's requirements.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 - 2. Remove snow and ice as required to minimize accumulations.
- F. Project Signs: Coordinate signs with Owner's requirements and requirements of authorities having jurisdiction. Unauthorized signs are not permitted.
- G. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- I. Temporary Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At substantial Completion, restore elevators to condition existing before initial use, including replacing corn cables, guide shoes and similar items of limited life.
 - 1. Do not load elevators beyond their rated weight capacity.
 - 2. Provide protective coverings, barriers, devices, signs or other procedures to protect elevator car and entrance doors and frame. If, despite such protection,

elevators become damaged, engage elevator installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop. Make required repairs and refinish entire unit or provide new units as required.

- J. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are cleaned, protected and finishes restored to new condition at time of Substantial Completion and is acceptable to Owner.
 - 1. Maintain means of egress.
 - 2. If stairs become damaged, restore damaged areas so no evidence remains of correction of work.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- G. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- H. Maintain appearance of walkway for duration of the Work.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- I. Temporary Enclosures: Provide temporary, weathertight, enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- J. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas from fumes and noise.
 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side and fire retardant-treated plywood on construction operations side.
 2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6 mil polyethylene sheet, extending sheets 18 inches up the side walls. Overlap and tape full length of joints. Cover floor with fire-treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partitions with not less than 48 inches between doors. Maintain walk-off mats in vestibule, for dust control.
 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 4. Seal joints and perimeter. Equip partitions with gasketed duct proof doors and security locks where openings are required.
 5. Protect air-handling equipment.
 6. Provide walk-off mats at each entrance through temporary partitions or entrances into the work space.
- K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 1. Prohibit smoking in construction areas.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Periodically collect and remove waste containing cellulose or other organic matter.
 - 4. Discard or replace water-damaged material.
 - 5. Do not install material that is wet.
 - 6. Discard, replace, or clean stored or installed material that begins to grow mold.
 - 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use permanent HVAC system to control humidity.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits. Refer to Technical specification sections for additional and more stringent criteria.
 - a. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 - 2.
- C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 016000 - PRODUCT REQUIREMENTS

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 administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.3 DEFINITIONS

- A. Products: Items obtained 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.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process 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 and equipment from those required by the Contract Documents and proposed by Contractor. Refer to Division 01 Section "Substitution Procedures".
- C. Basis-of-Design Product Specification: A specification in which 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 additional manufacturers named in the specification.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- D. Hazardous substances Prohibited by Law: Including, but not limited to, any product, material, element, constituent, chemical, substance, compound or mixture which is defined in, including under or regulated by any environmental laws.
- E. Environmental Laws: Applicable local, state and federal laws, rules, ordinances, codes, regulations and requirements in effect at the time Contractor's services are rendered, any amendments for Contractor's services rendered after the effective date of any such amendments.

1.4 ACTION SUBMITTALS

- A. Comparable Product Requests: Comply with requirements in Division 01 Section "Submittal Procedures". Show compliance with requirements. Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and drawing numbers and titles.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.
- C. Contractor shall submit an affidavit on construction company letterhead signed by an officer of the company, notarized by a notary public, which certifies compliance with the environmental laws controlling hazardous substances for the construction of this project.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B. Compliance: Contractor shall take whatever measures deemed necessary to insure that all employees suppliers, vendors, fabricators, subcontractors or their assigns, to comply with hazardous substance requirements

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 and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

- A. 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.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," "equivalent" or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
7. Products and materials brought onto the Project Site, and Products and materials incorporated into the Work, shall comply with environmental laws.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will no be considered unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated 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 requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require 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

3.1 RESTRICTION OF HAZARDOUS SUBSTANCES

- A. Contractor agrees that it shall not knowingly after reasonable diligence and effort, incorporate into the Work any hazardous substance other than as may be lawfully contained within products, except in accordance with applicable environmental laws. Further, in performing any of its obligations hereunder, Contractor shall not cause any release of hazardous substances into, or contamination of, the environment, including soil, the atmosphere, any watercourse or ground water, except in accordance with applicable environmental law. In the event that Contractor engages in any of the activities prohibited in this paragraph, to the fullest extent permitted by law, Contractor

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

herby indemnifies and holds harmless Owner and its partners, members, officers directors, agents, employees and consultants from and against any and all claims, damages, losses, causes of action , suits and liabilities of every kind, including, but not limited to, expenses of litigation, court costs, punitive damages and attorney's fees, arising out of , incidental to or resulting from the activities prohibited.

- B. In the event Contractor observes on the Project Site any substance which Contractor reasonably believes to be a hazardous substance, and which is being introduced into the Work, or exists on the Project Site, in a manner violative of any applicable environmental laws, Contractor shall immediately notify Owner and report the condition to Owner in Writing. The Work in the affected area shall not thereafter be resumed except by written authorization of Owner if in fact a hazardous substance has been encountered and has not been rendered harmless. In the event that Contractor fails to give Owner proper notification hereunder, upon knowingly observing a hazardous substance at the Project Site, to the fullest extent permitted by the law, Contractor hereby indemnifies and holds harmless Owner, and all of its partners, members, officers directors, agents, employees and consultants from and against all claims, damages, losses, causes of action, suits and liabilities of every kind, including, but not limited to, expenses of litigation, court cost, punitive damages and attorneys' fees, arising out of, incidental to, or resulting from Contractor's failure to stop the Work.
- C. If Owner believes that hazardous substances any have been located, generated, manufactured, used or disposed of on or about the Project Site by Contractor or any of its employees, agents, subcontractor, suppliers or invitees, Owner may have environmental studies of the Project Site conducted as it deems appropriate, and Contractor shall be responsible for the cost of such studies to the extent that Contractor or any of its employees, agents, subcontractors, suppliers or invitees are responsible for the presence of any hazardous substances.

END OF SECTION 016000

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Installation of the Work.
 - 3. Cutting and Patching.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.
- B. Related Sections:
 - 1. Section 013300 "Submittal Procedures" for submitting surveys.
 - 2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Cutting and Patching Plan: Submit plan describing procedures at least 5 days prior to the time cutting and patching will be performed, requesting approval to proceed. Describe the extent of the cutting and patching.

1.5 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection. Do not cut and patch structural elements in a manner that could change their load-caring capacity or increase deflection.
 2. 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.
 3. Other Construction Elements: Do not cut and patch other construction elements or 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.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction 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.
 - a. If possible, retain original installer or fabricator to cut and patch exposed Work. If it is not possible to engage original installer or fabricator, engage another recognized experienced and specialized firm.
- B. 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.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

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.
 - 1. For projects requiring compliance with sustainable design and construction practices and procedures, utilize products for patching that comply with requirements of Sustainable Design materials.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: 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 electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utilities.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 INSTALLATION, GENERAL

- A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:
 1. Respective manufacturer/fabricator's written installation instructions.
 2. Accepted submittals.
 3. Contract Documents.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by isolating metals and other materials from direct contact with incompatible materials.

3.3 PREPARATION

- A. General: Comply with manufacturer's instructions, recommendations and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants or errors which would result in poor or potentially defective installation or would cause latent defects in Work.
- B. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- C. Existing Utility Interruptions at Renovation Work: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 1. Notify Owner not less than 72 hours in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Owner's written permission.
- D. 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.
- E. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- F. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect

according to requirements in Division 01 Section "Project Management and Coordination."

3.4 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings. If discrepancies are discovered, notify Architect promptly.
- B. General: Lay out the Work using accepted surveying practices.
 - 1. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 2. Inform installers of lines and levels to which they must comply.
 - 3. Check the location, level and plumb, of every major element as the Work progresses.
 - 4. Notify Architect when deviations from required lines and levels exceed allowable tolerances.

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 and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated. Unless indicated otherwise in the Contract Documents.
- 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. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately

located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

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.
 3. Coordinate installation of anchorages. 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.
- H. 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.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 Section "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- H. 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 practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical 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 minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 - b. Patch fire rated assemblies with materials to match existing and maintain assembly fire rating.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: As applicable, provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. 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 waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Utilize containers intended for holding waste materials of type to be stored. E.g. blue colored containers with labeling and symbols for bio-waste.
- 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 in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."
- H. Remove constriction markings not required and graffiti immediately, repairing or replacing damaged materials.
- I. 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. 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 operability 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.

3.9 STARTING AND ADJUSTING

- A. As applicable, coordinate startup and adjusting of equipment and operating components with commissioning requirements in Division 01 specification sections..
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.10 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

3.11 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 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 and scratches, of reflective surfaces.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging and /or recycling nonhazardous demolition and construction waste.
 - 2. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 024119 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycle, reuse or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Salvage / Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Waste Management Conference: Conduct conference at Project site. Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan. Plan shall consist of waste identification, and waste reduction work plan, and cost / revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan; List each type of waste and whether it will be salvaged, recycled or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery and handling and transportation procedures.
 - 1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses and telephone numbers.
 - 2. Disposed materials; Indicate how and where materials will be disposed of. Include name, address and telephone number of each landfill and incinerator facility.
 - 3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling and designated location of project site where materials separation will be located.
- D. Cost / Revenue Analysis: Indicate total cost of waste disposal as if there was not waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
 - 1. Total quantity of waste.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged / recycled materials.
5. Savings in hauling and tipping fees that are avoided.
6. Handling and transportation costs. Include cost of collection containers for each type of waste.
7. Net additional cost or net savings from waste management plan.
- 8.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 1. Comply with Davison 01 Section "Temporary Facilities and Controls for operation, termination and removal requirements.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
- C. Site Access and Temporary controls: conduct waste management operations to ensure minimum interference with road, streets, walks, walkways and other adjacent occupied and used facilities.
 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated and sold.
 2. Comply with Division 01 section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection and noise control.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
 1. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
3. Store components off the ground and protect from the weather.
4. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.3 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 017700 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
 - 6. Attic stock provisions.
- B. Related Sections:
 - 1. Section 017300 "Execution" for progress cleaning of Project site.
 - 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 4. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBMITTALS

- A. Contractor's list of Incomplete items: Initial submittal at Substantial Completion.
- B. Certified List of Incomplete Items: Final submittal at Final completion.
- C. Certificates of Release: From authorities having jurisdiction.
- D. Certificate of Insurance: for Continuing coverage.
- E. Field Report: for pest control inspection.
- F. Schedule of maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list, including the value of each item on the list and reasons why the Work is incomplete).
- B. Submittals Prior to Substantial Completion: Complete the following prior to requesting inspection for determining date of Substantial Completion: Complete the following prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys and similar final record information.
 - 3. Submit maintenance material submittals specified in individual Divisions 02 through 33 sections, including tools, spare parts, extra materials and similar items and deliver to location designated by Architect. Label with manufacturer' name and model number where applicable.
 - a. Schedule of maintenance Material Items; Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.
 - 4. Submit test / adjust / balance records.
- C. Procedures Prior to Substantial Completion: complete the following prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training".
 - 6. Advise Owner of changeover in heat and other utilities.
 - 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - 8. Terminate and remove temporary facilities from Project Site, along with mockups, construction tools and similar elements.
 - 9. Complete final cleaning requirements, including touchup painting.

10. Touch up and otherwise repair and restore marred exposed finishes to element visual defects.
- D. 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 punch 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.
- E. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of substantial Completion.

1.5 FINAL COMPLETION

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
 1. submit a final Application for Payment according to Division 01 Section "Payment Procedures".
 - a. If applicable, the final change order must be executed and included in the final application for payment before final completion can be achieved.
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion Inspection list of items to be completed or corrected (punch list). Certified copy of the list shall state that each item has been cumulated or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection Report.
- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of 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. Use CSI Form 14.1A, or form acceptable to Owner.
 - 1. Organize list of spaces.
 - 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.
 - 4. Submit list of incomplete items in the following format:
 - a. Electronic PDF.

1.7 WARRANTIES

- A. Submittal Time Submit written warranties for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within minimum number days, as required by the Contract, of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Warranty electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.
 - 1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform 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, as applicable, before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep areas broom clean. Remove surplus material from Project site.
 - c. Clean exposed exterior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances.
 - d. 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.
 - e. Vacuum carpet and similar surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - f. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - g. Remove labels that are not permanent.
 - h. Remove all graffiti and construction writing.
 - i. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and other foreign substances.

- j. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - k. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers and grills.
 - l. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - m. Clean light fixtures, lamps, globes and reflectors to function with full efficiency.
 - n. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Division 01 Section "Temporary Facilities and Controls". Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls". And Division 01 Section "Construction Waste Management and Disposal." Whichever is the more restrictive and as follows:
- 1. 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.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials and properly adjusting operation equipment. Where damage or worn items cannot be repaired or restored, provide replacements. Remove and Replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
- 1. Remove and replace chipped, scratched and broken glass, reflective surfaces and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace all lamps and starters to comply with requirements for new fixtures.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

C. All Warranties remain in effect.

3.3 ATTIC STOCK PROVISIONS

A. Where applicable, the following quantities of attic stock shall be provided:

- | | | |
|----|--------------------------------|-------------------------------------|
| 1. | Carpet | 50 LF per 600 SF |
| 2. | Carpet Base | 200 LF |
| 3. | Floor and Wall Tile (restroom) | 2 boxes |
| 4. | Resilient Flooring | 2 boxes |
| 5. | Sheet Vinyl | 250 SF |
| 6. | Rubber Wall Base | 1 box/110 LF |
| 7. | Paint | Interior colors; 6 – 8 gallons each |
| 8. | Ceiling Tile | Each type; 4-5 cartons each |

END OF SECTION 017700

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 017823 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. 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. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

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 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect and Owner.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and before commencing demonstration and training. Architect will return copy with comments.
1. Correct or revise each manual to comply with Architect's. Submit copies of each corrected manual prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. 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 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- 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: 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 and contact information for CM/GC.
 6. Name and contact information for Architect.
 7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 8. 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.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

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. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Descriptions: Include the following:
 - 1. Product name and model number. Use designations for products indicated on Contract Documents.
 - 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 MANUALS

- 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 and drawing or schedule designation or identifier where applicable.
- 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 MANUALS

- 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 and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recording, 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 - EXECUTION

3.1 MANUAL PREPARATION

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.
- E. 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 Section 017839 "Project Record Documents."
- F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Sections:
 - 1. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 02 through 49 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit one scanned record PDF electronic files of scanned record.
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are approved.
 - b. Final Submittal:
 - 1) Submit one scanned record PDF electronic files of scanned record.
 - 2) Submit a complete copy of the form provided in section 1.7.8 of this document.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Record Specifications: Submit annotated PDF electronic files of project specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various contraction activities. Submit-annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.1 ELECTRONIC PROJECT MANAGEMENT SOFTWARE

- A. Electronic file of Project Record Documents: Provide Architect with an independent electronic archive of accepted project record documents using electronic project management software as defined in Division 01 section "Projects management and Coordination", in addition to the printed documents described elsewhere in this section.

2.2 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawing as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual and entity who obtained record data, whether individual or entity is installer, subcontractor or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an approved drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 - 2. Content: types of items requiring marking include, but are not limited to, the following.
 - a. Dimensional changes to drawings.
 - b. Revisions to details shown on drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.

- g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-color pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original drawings.
 6. Note Construction Change Directive numbers, Alternate numbers, Change Order numbers, and similar identification, where applicable.

2.3 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacture, supplier, installer and other information necessary to provide a record of selections made.
 4. Note related Change Orders, record Product Data and record Drawings where applicable.

2.4 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturers written instructions for installation.
 3. Note related Change Orders, record Specifications and record Drawings where applicable.
- B. Format: Submit record Product Data as scanned PDF electronic file of marked-up paper copy of Product Data.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.5 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked up miscellaneous record submittals.
 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

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

END OF SECTION 017839

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following, as applicable for Bid Package #1 and Bid Package #2:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
- B. Related Sections:
 - 1. Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment and products.
- B. Qualification Data: For instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: for each participant and for each training module, submit results and documentation of performance-based test.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.4 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
- B. Reinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project management and Coordination". Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructor's personnel, audiovisual equipment and facilities needed to avoid delays.
 - 3. Review required content of instructions.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.

- b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Owner will furnish Contractor with names and positions of required training participants.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, with at least seven days' advance notice.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Training Location and Reference material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 017900

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 024119 - SELECTIVE DEMOLITION

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. Demolition and removal of selected portions of building or structure.
2. Protection of equipment and materials to remain in place.
3. Demolition does not include: Roofing, Exterior Windows and Doors, the building envelope – unless otherwise indicated.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and leave in place.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 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.
 - 5. Review areas where existing construction is to remain and requires protection.
 - 6. Use of Elevator and Stairs.

1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for Exterior environmental dust control and zoning noise control for building neighbors. Indicate proposed locations and construction of barriers.
- B. 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.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
- C. Predemolition Photographs or Video: Show existing conditions of all areas, including adjoining construction, finish surfaces; to prevent areas and existing materials, indicated to stay, to be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.
- D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- E. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged, if any.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.8 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD 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.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical, unless otherwise noted.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work. A copy of the hazardous materials report has been included for the Contractors convenience.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If suspected 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 is not permitted.
- F. Utility Service: Maintain existing utilities to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- D. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs or video.
 - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
 - 2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed or Relocated: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off utilities with utility companies.
2. If services/systems are required to be removed or relocated, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove completely of piping that is indicated to be indicated to be removed, unless otherwise noted.
 - b. Equipment to Be Removed: Disconnect and remove equipment completely unless otherwise noted.
 - c. Equipment to Be Removed and kept in place: Disconnect and cap equipment and the connections completely, clean, and leave equipment in place.
 - d. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts that is at the building envelope with same or compatible ductwork material.

3.4 PROTECTION

- A. Temporary Protection: 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 demolition areas.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, floors, and other existing work to remain or that are exposed during selective demolition operations.
 4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- B. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

- 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. Do not disturbing supporting members on any 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. 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 fire watch during and for at least 2 hours after flame-cutting operations.
 6. Maintain adequate ventilation when using cutting torches.
 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 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. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."
- 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.
- C. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
 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.
- D. Existing Items to Remain: Protect construction and equipment indicated to remain against damage and soiling during selective demolition.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least **3/4 inch** at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- C. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- D. Ceramic Tile: Break up and remove.
- E. Roofing: Do not remove; this is part of the building envelope that remains.
- F. Exterior Doors and Window: Do not remove; this is part of the building envelope that remains.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- G. Building Envelope: Do not remove; this includes, but is not limited to, exterior walls and columns.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and recycle or dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

3.8 CLEANING

- A. 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.

END OF SECTION 024119

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 044200 – DIMENSION STONE CLADDING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Design Services: Provide a Proprietary Design/Build thin stone panel, modified curtain wall cladding system for project use which includes all materials and labor as required to provide a completed system including, but not limited to the following:
 - 1. Design, Coordinate, and provide the complete with all anchors, sealants, and components as required for a complete installation and designed to withstand applicable building code requirements.
 - 2. Provide the services of a registered professional engineer in the State of Utah, to provide engineering approval for the system in the form of a system suitability review and compliance document. Subject compliance document will be signed and stamped by a registered professional engineer in the project State.

1.02 DESIGN REQUIREMENTS:

- A. The Gridworx extruded aluminum channels are a design/build system. The anchors and stone are designed to attach to the substrate at 16" centers, unless otherwise indicated. Precision Wall Systems, Inc. is responsible for providing engineering approval for the system, IF APPLICABLE. Provide a structural engineer for calculations for lateral movement.
- B. The thin stone panels veneer shall be anchored at spacings to meet all Building Codes governing this project.

1.03 QUALITY ASSURANCE

- A. Installer: Company or person specializing in commercial masonry or stone work with 7 years documented experience.

1.04 PRODUCT DATA

- A. Submit manufacturers' data sheets.

1.05 SAMPLES

- A. Submit three sample of thin stone panels to illustrate color and texture.

1.06 SHOP DRAWINGS

- A. Provide project submittal drawings for architect's review and approval.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.07 MOCKUPS

- A. Construct mockup of thin stone panels.
- B. Construct typical mockup panel to illustrate units, coursing, sealant joints , and support system.
- C. Mockup may remain part of the finished Work if approved.
- D. The approved jobsite mockup panel shall be used to determine the level of workmanship expected on the buildings veneer installation.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver thin stone panels to the site in approved protective film. Prevent damage to units.
- B. Lift skids with proper and sufficiently long slings or forks with protection to prevent damage to units. Protect edges and corners.
- C. Do not store units outside and store units in a manner designed to prevent damage and staining of units.
- D. Stack units at least 3" above grade.
- E. Do not allow ice or snow to be placed or formed on the units. Store inside. Verify weight requirements where stored.
- F. Do not use salt or calcium-chloride to remove ice from unit surfaces.

PART II. PRODUCTS

2.01 MANUFACTURERS:

- A. Supplier of thin stone panels having products considered acceptable for use: Delta Stone, Contact: Bryce Harding. Phone: 435.671.6688 email: bryce@deltastoneproducts.com

2.02 MATERIALS

A. Stone

1. Stone panels: Provide stone of soundness (hardness and density), texture, graining, color, and tone, matching the samples in the Architect's field office and subject to the Architect's acceptance. Stone shall not be less than 1-1/4", unless otherwise noted. Stone shall be sound and free from defects which will impair strength, durability or appearance, and provided from a single quarry source to satisfy the total requirements of the project. Quarry and fabrication plant facilities shall be available for the Architect's inspection at any time. Physical properties shall comply with applicable ASTM standards. All Limestone is to meet the minimum criteria of a Classification Type II or III limestone as per ASTM C568.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Provide stones of type, color and finish as scheduled below. Finish all exposed edges as scheduled.
 - a. Cottonwood Limestone by Delta Stone. Finish: Honed
 - 1) Compressive Strength: 5,509 pcf (or greater), to ASTM C170.
 - 2) Density: 141 pcf (or greater), to ASTM C97.
 - 3) Flex Strength: 738 psi (or greater), to ASTM C880.
 - 4) Modulus of Rupture: 949 psi (or greater), to ASTM C99
 - B. Aluminum alloy extrusions with a composition of 6005 alloy with a T5 temper. Channels provided in twelve foot (12') lengths. ASHRAE 90.1-2010 vertical mullions provided in twelve foot (12') lengths. ASHRAE 90.1-2010 discrete clips are specified in length by the curtain wall engineer. Insulation is not provided by Precision Wall Systems and is the responsibility of others. "L Brackets" are specified in length by the curtain wall engineer and set at 1 per linear foot of panel, with a minimum of 2 L-Brackets per panel. Aluminum components of the Gridworx system are anodized with a clear coat or with colored finishes of AA M12C22A21 meeting the standards of AAMA 611-98.
 - C. Threaded Fasteners:
 1. Steel Studs - Elco Drill-Flex or HILTI Kwik-Flex fasteners, #12 X 2" self-drilling structural fasteners – SAE J 429 / Grade 5 with a Stalgard Coating. Installation to be on studs with a minimum of 18 gaugeset on 16" centers.

2.03 FABRICATION TOLERANCES

- A. Fabricate thin stone panels to the following tolerances:
 1. Unit Length: plus or minus 1/16".
 2. Unit Height: plus or minus 1/16".
 3. Unit Thickness: plus or minus 1/8"
 4. Kerf Depth: plus 1/16" minus 0"
 5. Kerf Width: plus 1/16" minus 0"
 6. Deviation from Square: plus or minus 1/16", with measurement taken using the longest edge as the base.
 7. Unit Face Deviations: plus or minus 1/16".
- B. Safety Factor
 1. Limestone
 - a. Minimum safety factor of 8

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that site conditions are ready to receive work.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Start work only after unacceptable conditions have been corrected. Beginning of installation means acceptance of site conditions.

3.02 INSTALLATION:

- A. Installer will be familiar with the procedures and recommendations and held to the requirements of the Gridworx Mechanical Stone Cladding System Installation Guide furnished by Precision Wall Systems, Inc.

3.03 CUTTING OF THIN STONE PANNEL UNITS

- A. Cut thin stone panels with a wet-saw.
- B. Pre-soak units using clean water prior to cutting.
- C. Clean cut units using a stiff fiber brush and clean water. Allow units to surface dry prior to placement.
- D. All thin stone panels shall be cut accurately to shape and dimensions and full to the square, with jointing as shown on drawings
- E. Any miscellaneous cutting and drilling of thin stone panels necessary to accommodate other trades will be the responsibility of the installer.
- F. Incidental cutting such as for window frame clips, etc., which is normally not considered to be the responsibility of the thin stone panels supplier, will be provided only by arrangement by the contractor with the thin stone panels supplier.

3.04 COURSING

- A. Place masonry to lines and levels indicated.
- B. Maintain thin masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.
- C. Place thin masonry units as indicated on drawings.
- D. Maintain sealant joint thickness of 3/8", unless otherwise indicated.

3.05 TOLERANCES

- A. Variation in Alignment from Unit to Adjacent Unit: 1/16" maximum.
- B. Variation of Sealant Joint Thickness: 1/16" every 144".

3.06 INTERFACE WITH OTHER WORK

- A. Thin stone panels coming in contact with structural work shall be back-checked.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Thin stone panels resting on structural work shall have beds shaped to fit the supports as required. Maintain a minimum of 1" clearance, minimum at metal studs and sheathing board) between stone backs and adjacent structure. (Note: some bolted connections may require more space than this. Subcontractor shall verify and make provision for these conditions.

3.07 CLEANING

- A. Clean the thin stone panels as work progresses.
- B. Post-Construction: Clean [a 100 sq. ft. area of wall designated by Consultant] [mock-up panel] as directed below and leave for one week. If no harmful effects appear clean thin stone panels veneer as follows:
 - 1. Protect other work from damage.
 - 2. Remove large particles with [stiff fiber brushes] [wood paddles] without damaging surface. Saturate thin units with clean water and flush off loose dust and dirt.
 - 3. Scrub with solution of 1 tsp. trisodium phosphate and 1 tsp. household detergent dissolved in 4 cups of clean water using stiff fiber brushes, and then clean off immediately with clean water using a hose.
 - 4. Repeat cleaning process as often as necessary to remove any stains.
- C. Acids are not permitted.
- D. The use alternative cleaning solutions and methods for difficult to clean units only after consultation with thin unit manufacturer.

3.08 PROTECTION

- A. Protect thin units from damage resulting from subsequent construction operations.
- B. Use protection materials and methods which will not stain or damage the thin stone panels.
- C. Remove protection materials upon Substantial Performance of the Work, or when risk of damage is no longer present.
- D. At all times, walls shall be adequately protected.

END OF SECTION 044200

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 055000 - METAL FABRICATIONS

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, where indicated:
 - 1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast or built into concrete.
 - 2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.3 COORDINATION

- A. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, and items with integral anchors,. Deliver such items to Project site in time for installation.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following, where indicated:
 - 1. Steel framing and supports for applications where framing and supports are not specified in other Sections.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates, if any.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel." See General Structural Notes for additional requirements.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Preinstallation Conference: Conduct conference at Project site.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Use special care in handling to prevent twisting, warping, nicking, and other damage. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- D. Steel Tubing: ASTM A500/A 500M, cold-formed steel tubing. (Refer to General Structural Notes on Drawings.)
- E. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.
- F. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- G. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- H. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm), unless otherwise indicated.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Material for exterior applications: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B, with G90 (Z275) coating; 0.064-inch (1.6-mm) nominal thickness.
3. Material for interior applications: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B; 0.0677-inch (1.7-mm) minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 1. Provide stainless-steel fasteners for fastening aluminum.
 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts for weathering type steel: Regular hexagon-head bolts, ASTM A 325, Type 3 (ASTM A 325M, Type 3); with hex nuts, and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A, with hex nuts, ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3); and, where indicated, flat washers.
- D. High-Strength Bolts, Nuts, and Washers: See General Structural Notes.
 1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.
- E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- G. Lag Screws: ASME B18.2.1.
- H. Plain Washers: Round, ASME B18.22.1.
- I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.3 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. 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. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. 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.

2.5 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to exposed exterior steel railings and bollards according to ASTM A 123/A 123M.
 - 1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 - 2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
 - 3. Galvanize exterior steel railings and bollards.
 - 4. Do not galvanize Architecturally Exposed Structural Steel (AESS).

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from 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.
 - 1. Fabricate units from slotted channel framing where indicated.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Furnish inserts for units installed after concrete is placed.

- C. Galvanize exposed exterior miscellaneous steel railings and bollards where indicated.
- D. Prime interior miscellaneous framing and supports with zinc-rich primer or primer specified in Sections 099123 "Interior Painting" or 099600 "High-Performance Coatings" where indicated.

2.7 FRAMING AND SUPPORTS

- A. General: Provide steel frame supporting items as indicated on the Drawings and the delegated design Shop Drawings.
- B. Fabricate units from steel tubes of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as follows:
 - 1. Tube Steel: Primed steel.
- C. Prime framing and supports with primer specified in Section 099123 "Interior Painting"
- D. Prime exterior galvanized steel railings and bollards with primer specified in Section 099600 "High-Performance Coatings".

2.8 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from 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.
- C. Prime interior and exterior miscellaneous steel trim with primer specified in Section 099600 "High-Performance Coatings."

2.9 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.10 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 1. Shop prime with primers specified in Section 099123 "Interior Painting" unless primers specified in Section 099600 "High-Performance Coatings" are indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 2. Other Items: SSPC-SP 3, "Power Tool Cleaning" unless otherwise indicated.
 3. AESS: As indicated in this Section.
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 2. .

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 INSTALLATION, GENERAL

- A. 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.
- B. 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.
- C. Field Welding: Comply with the following requirements:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
1. Cast Aluminum: Heavy coat of bituminous paint.
 2. Extruded Aluminum: Two coats of clear lacquer.

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.
- B. Anchor supports for overhead grilles securely to, and rigidly brace from, building structure.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting" and Section 099600 "High-Performance Coatings."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 057000 - DECORATIVE METAL

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. Decorative Stainless-Steel Elevator Jambs.
 - 2. Decorative Stainless-Steel Elevator Doors.

1.3 COORDINATION

- A. Coordinate installation of anchorages for decorative metal items. 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.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product, including finishing materials.
- B. Shop Drawings: Show fabrication and installation details for decorative metal.
 - 1. Include plans, elevations, component details, and attachment details.
 - 2. Indicate materials and profiles of each decorative metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.
- C. Samples for Verification: For each type of exposed finish.
 - 1. Sections of linear shapes.
 - 2. Samples of welded and brazed joints showing quality of workmanship and color matching of materials.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
- C. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing decorative metal similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Installer Qualifications: Fabricator of products.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."
- D. Mockups: Build mockups 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.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store decorative metal in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.
- B. Deliver and store cast-metal products in wooden crates surrounded by enough packing material to ensure that products are not cracked or otherwise damaged.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with decorative metal by field measurements before fabrication and indicate measurements on Shop Drawings.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

PART 2 - PRODUCTS

2.1 DECORATIVE METAL FABRICATORS

A. Manufacturer:

1. Approved local manufacturer.

2.2 METALS, GENERAL

- #### A. Metal Surfaces, General: Use materials with smooth, flat surfaces unless otherwise indicated. Use materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.3 STAINLESS STEEL

- #### A. Tubing: ASTM A 554, Grade MT 304.
- #### B. Pipe: ASTM A 312/A 312M, Grade TP 304.
- #### C. Castings: ASTM A 743/A 743M, Grade CF 8 or Grade CF 20.
- #### D. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.
- #### E. Bars and Shapes: ASTM A 276, Type 304.

2.4 FASTENERS

- #### A. Fastener Materials: Unless otherwise indicated, provide the following:

1. Stainless-Steel Items: Type 304 stainless-steel fasteners.

- #### B. Fasteners for Anchoring to Other Construction: Unless otherwise indicated, select fasteners of type, grade, and class required to produce connections suitable for anchoring indicated items to other types of construction indicated.

- #### C. Provide concealed fasteners for interconnecting components and for attaching decorative metal items to other work.

2.5 MISCELLANEOUS MATERIALS

- #### A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.6 FABRICATION, GENERAL

- A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- B. Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- D. Form simple and compound curves in bars, pipe, tubing, and extruded shapes by bending members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces.
- E. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- F. Mill joints to a tight, hairline fit. Cope or miter corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.
- G. Comply with AWS for recommended practices in shop welding behind finished surfaces without distorting or discoloring exposed side. Clean.
 - 1. For all welding, finish joints to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 Welds: no evidence of a welded joint.

2.7 DECORATIVE STAINLESS STEEL ELEVATOR DOOR JAMBS AND ELEVATOR DOORS.

- A. General: Fabricate decorative Elevator Jambs and doors to designs 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. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.9 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
- C. Directional Satin Finish: No. 4., unless otherwise indicated.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative metal.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Provide concealed anchorage devices and fasteners where needed to secure decorative metal to in-place construction.
- B. Perform cutting, drilling, and fitting required to install decorative metal. Set products accurately in location, alignment, and elevation, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.
- C. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, uniform reveals and spaces for sealants and joint fillers. Where cutting, welding, and grinding are required for proper shop fitting and jointing of decorative metal, restore finishes to eliminate evidence of such corrective work.
- D. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- E. Restore protective coverings that have been damaged during shipment or installation. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at same location.
 - 1. Retain protective coverings intact; remove coverings simultaneously from similarly finished items to preclude nonuniform oxidation and discoloration.
- F. Field Welding: Comply with applicable AWS specification for procedures of manual shielded metal arc welding and requirements for welding and for finishing welded

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

connections in "Fabrication, General" Article. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

3.3 CLEANING AND PROTECTION

- A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.
- B. Protect finishes of decorative metal from damage during construction period with temporary protective coverings approved by decorative metal fabricator. Remove protective covering at time of Substantial Completion.
- C. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057000

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 061053 – MISCELLANEOUS ROUGH CARPENTRY

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. Wood blocking and nailers.

1.3 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. RIS: Redwood Inspection Service.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPA: Western Wood Products Association.

1.4 ACTION 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 and net amount of preservative retained.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.5 INFORMATIONAL SUBMITTALS

- A. 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.
- B. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated wood.
 - 2. Power-driven fasteners.
 - 3. Powder-actuated fasteners.
 - 4. Expansion anchors.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, 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.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, blocking, and similar concealed members in contact with masonry or concrete.
 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 4. Wood framing members that are less than 18 inches above the ground.
 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Nailers.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber the following species:
1. Douglas fir-larch.
- C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
1. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 2. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 3. Northern species; No. 2 Common grade; NLGA.
 4. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.5 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated. (or) Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
- C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
- I. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- J. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 - 1. Comply with indicated fastener patterns where applicable.
 - 2. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD 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.
- C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

3.3 PROTECTION

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

END OF SECTION 061000

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

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. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.
3. Grommets for all types cabinets and other locations required as indicated on drawings.

- B. Related Requirements:

1. Section 061000 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
2. Section 064113 "Wood-Veneer-Faced Architectural Cabinets"..
3. Section 123623 "Plastic Laminate Countertops".
4. Section 123661 "Simulated Stone Countertops".

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate and cabinet hardware and accessories.
 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 2. Include upholstery fabrics, acoustic trackable backer, knit polyester substrate, Protocol track system with snap in fabric hardware and high density foam cushion material.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Shop Drawings: Show 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 reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.
 - 4. Apply AWI Quality Certification Program label to Shop Drawings.
 - 5. Shop Drawings to be reviewed by Architect.

- C. Samples for Verification:
 - 1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.
 - 2. Thermoset decorative panels, 8 by 10 inches, for each color, pattern, and surface finish, with edge banding on one edge.
 - 3. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
 - b. Miter joints for standing trim.
 - 4. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.5 CLOSEOUT SUBMITTALS

- 1. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator and installer.

- B. Product Certificates, for the following, where indicated:
 - 1. Composite wood and agrifiber products.
 - 2. Thermoset decorative panels.
 - 3. High-pressure decorative laminate.
 - 4. Adhesives.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Installer Qualifications: Fabricator of products.
- C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.10 COORDINATION

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" (AWI) for architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Custom.
- C. Type of Construction: Frameless.
- D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- E. Reveal Dimension: 1/2 inch.
- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Abet Laminati, Inc.
 - b. Formica Corporation.
 - c. Lamin-Art, Inc.
 - d. Panolam Industries International, Inc.
 - e. Wilsonart International; Div. of Premark International, Inc.
 - f. Approved equal.
- G. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGP.
 - 2. Post formed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade VGS.
 - 4. Edges: Use full round (bullnose) edge typical all locations.
 - 5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels, unless otherwise indicated.
- H. Inferior Woodwork shall be AWI custom grade. Box, shelf, door and drawer front edges for plastic laminate cabinets should have a PVC 0.12 inch matching edge banding.
- I. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.118 inch thick, matching laminate in color, pattern, and finish.
 - b. Edges of Thermoset Decorative Panel Shelves: PVC edge banding, 0.118 inch thick.
 - c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS, unless otherwise indicated.
2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
 3. Drawer Bottoms: (9) ply Baltic Birch plywood.
- J. Dust Panels: 1/4-inch plywood above compartments and drawers unless located directly under tops.
- K. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- L. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
- M. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As indicated on Drawings by laminate manufacturer's designations.

2.2 WOOD MATERIALS (Select from the following)

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Wood Moisture Content: 4 to 9 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
 2. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
 3. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
 4. Softwood Plywood: DOC PS 1, medium-density overlay.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

5. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
6. Marine Grade Plywood for wet loations.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 120 degrees of opening, self-closing.
 1. Basis of Design Product: Subject to compliance with requirements furnish and install Blum, Clip Top Blumotion 120 hinges, or a comparable Approved Equal product acceptable to the Owner and Architect.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- E. Shelf Rests: BHMA A156.9, B04013; metal, 5 mm, two-pin type with shelf hold-down clip.
- F. Drawer Runner Systems: Concealed runners for wood drawers:
 1. Box Drawer Runners, Heavy Duty Drawers, 24" wide or less:
 - a. Basis of Design Product: Blum Tandem Plus Blumotion #568H, heavy duty self closing full extension slides with 110 - 125 lb./pr. (45 kg) load rating. Standard finish. or a comparable Approved Equal product acceptable to Owner and Architect.
 2. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-200.
- G. Door Locks: BHMA A156.11, E07121.
 1. Basis of Design Product: Kenstan Lock Company, D Line, Disc Tumbler Lock, keyed alike, keyed different, or master keyed as directed by Owner. Standard finish. or a comparable Approved Equal product acceptable to Owner and Architect.
- H. Drawer Locks: BHMA A156.11, E07041.
 1. Basis of Design Product: Kenstan Lock Company, D Line, Disc Tumbler Lock, keyed alike, keyed different, or master keyed as directed by Owner. Standard finish, or a comparable Approved Equal product acceptable to Owner and Architect.
- I. Door and Drawer Silencers: BHMA A156.16, L03011.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- J. Grommets for Cable Passage: 2-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Color: Black.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.
- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content. Refer to Division 06 Section "Miscellaneous Rough Carpentry.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- D. Adhesives: Use low VOC adhesives that meet DFCM Sustainable Building requirements.
- E. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

- A. Fabricate cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1. Use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so 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 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.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood blocking, or hanging strips. No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish. Use toggle bolts through metal backing or metal framing behind wall finish.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, 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 cabinets on exposed and semiexposed surfaces.

END OF SECTION 064116

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 064216 - FLUSH WOOD PANELING

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. Flush wood paneling.
- 2. Wood furring, blocking, shims, and hanging strips for installing flush wood paneling that is not concealed within other construction.
- 3. Shop finishing of flush wood paneling.

- B. Related Requirements:

- 1. Section 061000 "Miscellaneous Rough Carpentry".
- 2. Section 064600 "Wood Trim".
- 3. 081416 "Flush Wood Doors".

1.3 COORDINATION

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

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

- B. Shop Drawings: For flush wood paneling.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Include plans, elevations, sections, and attachment details.
 2. Show details full size.
 3. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
 4. Show finished panel sizes, set numbers, sequence numbers within sets, and method of cutting panels to produce indicated sizes.
 5. For paneling veneered in fabrication shop, show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
 6. Millwork to be provided by a shop who is a Certified participant in AWI's QCP program.
- C. Samples: For each exposed product and for each color and finish specified, in manufacturer's or fabricator's standard size.
- D. Samples for Verification: For the following:
1. For Finish: Not less than 12 inch by 12 inch, for each species and cut, finished on one side and one edge.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.
- B. Product Certificates: For each type of product.
- C. Quality Standard Compliance Certificates: AWI Quality Certification Program.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
 1. Shop Certification: AWI's Quality Certification Program accredited participant.
- B. Installer Qualifications: Fabricator of products.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver paneling until painting and similar operations that might damage paneling have been completed in installation areas. Comply with temperature and humidity limitations stated in Architectural Woodwork Standards edition 2, section 2 Care and Storage prior to delivery and continuously thereafter.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature between 60 and 90 deg F during the remainder of the construction period.
- C. Field Measurements: Verify all dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed/concealed by construction and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PANELING FABRICATORS

- A. Source Limitations: Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of paneling and wood-veneer-faced architectural cabinets, wood trim, wood door frames and flush-wood doors faced with veneers from same flitches as paneling.
- B. Fabricators: Subject to compliance with requirements, available fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Fetzer; 6223 Double Eagle Circle, SLC, UT, 801.484.6103
Contact: Richard Shelley, LEED AP ID+C
 - 2. Fondell Woodwork; 1657 W. State Rd., Lehi, UT, 801.768.4467
Contact: John Kusterle
 - 3. Wavell Huber Wood Products; 180 N. 700 W., North Salt Lake, UT, 801.936.6080
Contact: Jeff Sessions or Eduardo Herandez

2.2 PANELING, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of flush wood paneling (wood-veneer wall surfacing) indicated for construction, finishes, installation, and other requirements.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Millwork to be provided by a shop who is a Certified participant in AWI's QCP program.
2. The Contract Documents contain requirements that are more stringent than the referenced woodwork quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

2.3 FLUSH WOOD PANELING (WOOD-VENEER WALL SURFACING)

- A. Grade: Premium.
- B. Wood Species and Cut: Mahogany Veneer, quarter sliced.
- C. Veneer Matching Method:
 1. Adjacent Veneer Leaves: Slip match.
 2. Within Panel Face: Balance match.
 3. Matching Veneer Panels with-in the room: blueprint.
 4. Grain direction: See drawings.
- D. Panel Core Construction: Particleboard or MDF.
 1. Thickness: 3/4 inch.
 2. Core materials to comply with ANSI 208.1 or 208.2 respectively.
- E. Exposed Panel Edges: Inset solid-wood or wood-veneer matching faces.
- F. Panel Reveals: Solid-wood or wood-veneer matching faces as detailed on drawings.
- G. Exposed Corners: Solid-wood or wood-veneer matching faces as detailed on drawings.
- H. Assemble panels with concealed French cleats or z-clips.

2.4 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select size required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Installation Adhesive: Product recommended by panel fabricator for each substrate for secure anchorage.

2.5 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Arrange paneling in shop or other suitable space in proposed sequence for examination by Architect. Mark units with temporary sequence numbers to indicate position in proposed layout.
 - 1. Lay out one elevation at a time if approved by Architect.
 - 2. Notify Architect seven days in advance of the date and time when layout will be available for viewing.
 - 3. Provide lighting of similar type and level as that of final installation for viewing layout unless otherwise approved by Architect.
 - 4. Rearrange paneling as directed by Architect until layout is approved.
 - 5. Architect, with the selected manufacturer, will determine which bundles from the flitch will be used for which elevations.
- C. Complete fabrication, including assembly, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times paneling fabrication will be complete.
- D. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.6 SHOP FINISHING

- A. General: Finish paneling at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing paneling, as applicable to each unit of work.
 - 1. Backpriming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces of paneling.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: System - catalyzed acrylic lacquer.
 - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
 - 4. Staining: Match Architect's sample, wheat finish, WH07 as sampled by VT Architectural Wood Doors.
 - 5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 - 6. Sheen: Match approved sample.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition paneling to humidity conditions in installation areas.
- B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install paneling to comply with quality standard grade of paneling to be installed.
- B. Install paneling level, plumb, true in line, and without distortion. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
 - 1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch.
- C. Anchor paneling to supporting substrate with French cleats or z-clips.
- D. Complete finishing work specified in this Section to extent not completed at shop or before installation of paneling. Fill nail holes with matching filler where exposed.
 - 1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective paneling, where possible, to eliminate defects. Where not possible to repair, replace paneling. Adjust for uniform appearance.
- B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064216

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 064400 - ORNAMENTAL WOODWORK

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 ornamental bench woodwork.
 - 2. Shop finishing of interior ornamental bench woodwork.

1.3 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 ornamental woodwork can be supported and installed as indicated.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. wood products.
 - 2. Finishing materials and processes.
- B. Shop Drawings: Show location of each item, including the following:
 - 1. Dimensioned plans, elevations, and sections of bench.
 - 2. Attachment devices, and other components.
 - 3. Show details.
 - 4. Lumber for Transparent Finish: Not less than 5 inches wide by 24 inches long, for each species and cut, finished on one side and one edge.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Manufacturer of products.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Architectural Woodwork Standards, Section 2.
- B. Do not deliver interior ornamental woodwork until painting and similar operations that could damage woodwork have been completed in installation areas.
- C. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.9 FIELD CONDITIONS

- A. Environmental Limitations for Interior Work: Do not deliver or install interior ornamental woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupancy for the remainder of the construction period.

1.10 COORDINATION

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

PART 2 - PRODUCTS

2.1 ORNAMENTAL WOODWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of ornamental woodwork indicated for construction, finishes, installation, and other requirements.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. The Contract Documents contain requirements that are more stringent than the Architectural Woodwork Standards. Comply with Contract Documents and Architectural Woodwork Standards.
- B. Architectural Woodwork Standards Grade: Premium.
- C. Wood Species and Cut:[Options in "Species" and "Cut" subparagraphs below are examples only. Retain one option in each subparagraph, or insert others.
 1. Species: Walnut
 2. Cut: Quarter cut/quarter sawn.
- D. Wood Moisture Content: 5 to 10 percent.

2.2 INTERIOR ORNAMENTAL WORK FOR OPAQUE FINISH

- A. Interior ornamental work for opaque finish includes the following:
 1. Bench.

2.3 FASTENERS

- A. General: for anchoring or fasteners provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
 1. Use Stainless steel unless otherwise indicated or recommended by manufacturer.

2.4 FABRICATION

- A. Fabricate ornamental woodwork to dimensions, profiles, and details indicated.
 1. Unless otherwise indicated, ease edges to radius indicated for the following:
 - a. Edges of Wood Members: 1/16 inch unless otherwise indicated.
- B. Complete fabrication, including assembly **and finishing**, to maximum extent possible before shipment to Project site.
 1. Disassemble components to the greatest extent possible and as necessary for shipment.
 2. Notify Architect seven days in advance of the dates and times ornamental woodwork fabrication will be complete.

2.5 SHOP FINISHING

- A. Finish ornamental woodwork at fabrication shop as specified. Defer only final touchup, cleaning, and polishing until after installation.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Drawings indicate items that are required to be shop finished. Finish such items at fabrication.
- C. Transparent Finish for Interior Items:
 - 1. Finish: System - 11, Polyurethane, Catalyzed.
 - 2. Staining: Match Architect's sample.
 - 3. Sheen: Match Architect's sample..

PART 3 - EXECUTION

3.1 REPAIR

- A. Repair damaged and defective ornamental woodwork, to eliminate functional and visual defects and to result in interior ornamental woodwork being in compliance with requirements of Architectural Woodwork Standards for the specified grade.
- B. Where not possible to repair, replace defective Work.
- C. Shop Finish:
 - 1. Fill nail holes with matching filler where exposed.

END OF SECTION 064400

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 072100 – ACOUSTIC INSULATION

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. Foam-plastic board insulation.
 - 2. Glass-Fiber Blanket Acoustic (sound) Insulation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET ACOUSTIC INSULATION

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. CertainTeed Corporation.
 - 2. Guardian Building Products, Inc.
 - 3. Johns Manville.
 - 4. Knauf Insulation.
 - 5. Owens Corning.
- A. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- B. Sustainability Requirements: Provide blanket insulation as follows:
 - 1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.

2.2 INSULATION FASTENERS

- A. Fasteners: As recommended by manufacturer.
- B. Adhesive: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to the complete application for insulation including what will interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Extend insulation 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. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
- E. Do not compress acoustic insulation to fit voids.
- F. Install insulation blankets from bottom, up, ensuring friction fit, free of sags, folds or open joints.
- G. Fit acoustic insulation blankets tight against studs.

3.3 INSPECTION / REPORT

- A. Prior to the installation of gypsum board and after the acoustic installation has been installed the General Contractor to set a meeting for inspection of the installation of the acoustic insulation. Those that are to attend are to be the General Contractor, Installer, Architect and Owner. The purpose of the inspection is to verify that the insulation has been installed with tight fitting against studs and to verify that there are no in appropriate compaction of insulation.
- B. Report: The General Contractor is to put together minutes of the meeting that reports all findings from the meeting. Distribution of the report is to be issued to all those in attendance, including the Architect and Owner.
- C. All inefficiencies are to be corrected before the gypsum wall board is installed.

3.4 PROTECTION / CLEANING

- A. Protect installed insulation and vapor retarders 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.
- B. Upon completion of installation, remove surplus materials, rubbish and tools.

END OF SECTION 072100

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 078413 - PENETRATION FIRESTOPPING

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. Through Penetrations Systems: UL "Fire Resistance Directory" Section XHEZ and Section XHHW.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
 - 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted

in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

- B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
- C. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hilti, Inc.
 2. 3M Fire Protection Products.
 3. Tremco, Inc.; Tremco Fire Protection Systems Group.
 4. USG Corporation.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is 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. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls and fire partitions as indicated on Drawings.
 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
- D. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- F. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those

components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-wool-fiber or 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 (Select from the following as indicated or required)

- A. Mineral Wool: Use only to fill in floor openings that are within shaft enclosures.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil or a backer on one side.
- G. 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 nonshrinking, homogeneous mortar.
- H. Blocks/Pillows/Bags: Reusable heat-expanding polyurethane blocks or pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.
- I. Fire rated Foams: Multicomponent, silicone-based liquid elastomers or two component polyurethane, that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. 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 nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping 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 the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with 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 penetration firestopping.
 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. 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 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 penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Installer is to be trained applicator approved by the Manufacturer.
 - 1. The work is to be installed by a contractor with at least one of the following qualifications:
 - a. FM 4991 Approved contractor
 - b. UL approved Contractor
 - c. Manufacturer accredited firestop Specialty contractor
- C. Install forming 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 firestopping.
- D. Install fill materials for firestopping 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 the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels or stencil when above the ceiling:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping 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 penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Firestopping for Metallic Pipes, Conduit, or Tubing:
 - 1. UL-Classified Systems: W-L-1049.
 - 2. F-Rating: 1 hour and 2 hours.
 - 3. T-Rating: 0 hour.
 - 4. L-Rating at Ambient: Less than 1 cfm/sq. ft.
 - 5. L-Rating at 400 deg F (204 deg C): Less than 1 cfm/sq. ft.
 - 6. W-Rating: No leakage of water at completion of water leakage testing.
 - 7. Type of Fill Materials: *SSS Intumescent Sealant*.
- C. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing:
 - 1. UL-Classified Systems: As indicated on Drawings.
 - 2. F-Rating: As indicated on Drawings.
 - 3. T-Rating: As indicated on Drawings.
 - 4. W-Rating: No leakage of water at completion of water leakage testing.
 - 5. Type of Fill Materials: As required to achieve rating.
- D. Penetration Firestopping Systems for Electrical Cables:
 - 1. UL-Classified Systems: As indicated on Drawings.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. F-Rating: As indicated on Drawings.
 3. T-Rating: As indicated on Drawings.
 4. W-Rating: No leakage of water at completion of water leakage testing.
 5. Type of Fill Materials: As required to achieve rating.
- E. Penetration Firestopping Systems for Insulated Pipes:
1. UL-Classified Systems: As indicated on Drawings.
 2. F-Rating: As indicated on Drawings.
 3. T-Rating: As indicated on Drawings.
 4. W-Rating: No leakage of water at completion of water leakage testing.
 5. Type of Fill Materials: As required to achieve rating.
- F. Penetration Firestopping Systems for Miscellaneous Electrical Penetrants:
1. UL-Classified Systems: As indicated on Drawings
 2. F-Rating: As indicated on Drawings
 3. T-Rating: As indicated on Drawings.
 4. W-Rating: No leakage of water at completion of water leakage testing.
 5. Type of Fill Materials: As required to achieve rating.
- G. Penetration Firestopping Systems for Miscellaneous Mechanical Penetrants:
1. UL-Classified Systems: As indicated on Drawings.
 2. F-Rating: As indicated on Drawings.
 3. T-Rating: As indicated on Drawings >.
 4. W-Rating: No leakage of water at completion of water leakage testing.
 5. Type of Fill Materials: As required to achieve rating.
- H. Penetration Firestopping Systems for Groupings of Penetrants:
1. UL-Classified Systems: As indicated on Drawings.
 2. F-Rating: As indicated on Drawings.
 3. T-Rating: As indicated on Drawings.
 4. W-Rating: No leakage of water at completion of water leakage testing.
 5. Type of Fill Materials: As required to achieve rating.
 - 6.
- I. Coordinate with drawings.

END OF SECTION 078413

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. UL "Fire Resistance Directory" Assemblies..

- B. Related Sections:

- 1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Sustainable Submittals:

- 1. Product Data: For fire-resistive joint system sealants, documentation including printed statement of VOC content.

- C. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

- 1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Engineering judgments must follow requirements set forth by the International Firestop council.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements", or a manufacturer authorized Firestop Specialty Contractor
- B. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:
 - 1. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
 - a. Fire-resistive joint system products bear classification marking of qualified testing agency.
 - b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
- D. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where required, provide fire-resistive joint 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 assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:
 - 1. Joints include those installed in or between fire-resistance-rated floor or floor/ceiling assemblies.
 - 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
 - 3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hilti, Inc.
 - b. 3M Fire Protection Products.
 - c. Tremco, Inc.; Tremco Fire Protection Systems Group.
 - d. USG Corporation.
- C. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. VOC Content: Fire-resistive joint system sealants 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- E. Low-Emitting Materials: Fire-resistive joint system sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. 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 fire-resistive joint 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 fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in 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 fire-resistive joint system.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner may engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory".
- B. Where Hilti Firestop Systems are indicated, they refer to Hilti Engineering Judgement Firestop Details. Refer to drawings for anticipated Hilti Details.
- C. Head-of-Wall, Fire-Resistive Joint Systems:
 - 1. UL-Classified Systems: HW-D
 - 2. Assembly Rating: 1 hour.
 - 3. Movement Capabilities: Class III.
- D. Head-of-Wall, Fire-Resistive Joint Systems:
 - 1. UL-Classified Systems: HW-D-0043.
 - 2. Assembly Rating: 1 hour and 2 hours.
 - 3. Nominal Joint Width: Verify in Field.
 - 4. Movement Capabilities: Class I percent compression or extension.
 - 5. L-Rating at Ambient: Less than 1 cfm/ft. (cu. m/s x m).
 - 6. L-Rating at 400 deg F (204 deg C): Less than 1 cfm/ft. (cu. m/s x m).
- E. Bottom-of-Wall, Fire-Resistive Joint Systems:
 - 1. UL-Classified Systems: BW-S-0003.
 - 2. Assembly Rating: 1 hour and 2 hours.
 - 3. Nominal Joint Width: Verify in Field.
 - 4. Movement Capabilities: Class I percent compression or extension.
 - 5. L-Rating at Ambient: Less than 1 cfm/ft. (cu. m/s x m).
- F. Wall-to-Wall, Fire-Resistive Joint Systems:
 - 1. UL-Classified Systems: R4024-7-8.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Assembly Rating: 1 hour and 2 hour.
3. Nominal Joint Width: ½" maximum.

G. Coordinate with Construction Documents.

END OF SECTION 078446

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 079200 - JOINT SEALANTS

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 the following where applicable:
 - 1. Silicone joint sealants.
 - 2. Urethane joint sealants.
 - 3. Polysulfide joint sealants.
 - 4. Latex joint sealants.
 - 5. Solvent-release-curing joint sealants.
 - 6. Preformed joint sealants.
 - 7. Acoustical joint sealants.
- B. Related Sections:
 - 1. Section 092900 "Gypsum Board" for sealing perimeter joints.
- C. Product Data: For each joint-sealant product indicated.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.
- E. Qualification Data: For qualified Installer.
- F. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- H. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

I. Warranties: Sample of special warranties.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Preinstallation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

A. 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 or are below 40 deg F (5 deg C).

2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.5 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: two years from date of Substantial Completion.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 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 joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 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. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 - 1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

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. **Stain-Test-Response Characteristics:** Where elastomeric sealants are specified in the Elastomeric Joint-Sealant Schedule to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- D. **Available Products:** Subject to compliance with requirements, joint sealant schedule, and manufacturer's recommendations, provide one of the products specified in each category below where needed:
 - 1. Elastomeric Joint Sealant Designation: ES1
 - a. Base Polymer: Urethane.
 - b. Type: M (multicomponent).
 - c. Grade: P (pourable).
 - d. Class: 25.
 - e. Additional Movement Capability: 25 percent movement in extension and 25 percent in compression for a total of 50 percent movement.
 - f. Use[s] Related to Exposure: T (traffic).
 - g. Uses Related to Joint Substrates: M (mortar) and, as applicable to joint substrates indicated, O (other).
 - h. Products:
 - 1) Sikaflex - 2c SL
 - 2) Tremco - THC-900
 - 3) Approved equal
 - 2. Elastomeric Joint Sealant Designation: ES2
 - a. Base Polymer: Neutral-curing silicone.
 - b. Type: S (single component).
 - c. Grade: NS (nonsag).
 - d. Class: 25.
 - e. Additional Movement Capability: 50 percent movement in extension and 50 percent in compression for a total of 100 percent movement.
 - f. Use[s] Related to Exposure: NT (nontraffic).

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

g. Uses Related to Joint Substrates: M (mortar), A (aluminum) and, as applicable to joint substrates indicated, O (other).

h. Products:

- 1) Dow Corning 795
- 2) GE Silpruf
- 3) Tremco Spectrem 2
- 4) Approved equal

3. Elastomeric Joint Sealant Designation: ES3

a. Base Polymer: Urethane.

b. Type: M (multi-component).

c. Grade: NS (nonsag).

d. Class: 25.

e. Additional Movement Capability: 50 percent movement in extension and 50 percent in compression for a total of 100 percent movement.

f. Use[s] Related to Exposure: NT (nontraffic).

g. Uses Related to Joint Substrates: M (mortar), A (aluminum) and, as applicable to joint substrates indicated, O (other).

h. Products:

- 1) Mameco Vulkem 922
- 2) Sikaflex 2C
- 3) Tremco Dymeric 511
- 4) Approved equal

4. Elastomeric Joint Sealant Designation: ES4

a. Base Polymer: Acid-curing silicone.

b. Type: S (single component).

c. Grade: NS (nonsag).

d. Class: 25.

e. Additional Movement Capability: 25 percent movement in extension and 25 percent in compression for a total of 50 percent movement.

f. Use[s] Related to Exposure: NT (nontraffic).

g. Uses Related to Joint Substrates: G (glass), A (aluminum) and, as applicable to joint substrates indicated, O (other).

h. Products:

- 1) Dow Corning 999-A
- 2) GE Contractors 1200
- 3) Pecora 863
- 4) Tremco Tremsil 300
- 5) Approved equal

5. Elastomeric Joint Sealant Designation: ES5

a. Base Polymer: Acid-curing, mildew-resistant silicone.

b. Type: S (single component).

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- c. Grade: NS (nonsag).
- d. Class: 25.
- e. Additional Movement Capability: 25 percent movement in extension and 25 percent in compression for a total of 50 percent movement.
- f. Use[s] Related to Exposure: NT (nontraffic).
- g. Uses Related to Joint Substrates: G (glass), A (aluminum) and, as applicable to joint substrates indicated, O (other).
- h. Products:
 - 1) Dow Corning - Trademate Tile and Ceramic
 - 2) GE - Sanitary 1700
 - 3) Tremco - Tremsil 600
 - 4) Approved equal

6. Elastomeric Joint Sealant Designation: ES6

- a. Base Polymer: Acid-curing silicone.
- b. Type: S (single component).
- c. Grade: NS (nonsag).
- d. Class: 25.
- e. Additional Movement Capability: 25 percent movement in extension and 25 percent in compression for a total of 50 percent movement.
- f. Use[s] Related to Exposure: NT (nontraffic).
- g. Uses Related to Joint Substrates: G (glass), A (aluminum) and, as applicable to joint substrates indicated, O (other).
- h. Products:
 - 1) Dow Corning 999-A
 - 2) GE Contractors 1200
 - 3) Pecora 863
 - 4) Tremco Tremsil 300
 - 5) Approved equal

7. Elastomeric Joint Sealant Designation: ES7

- a. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
- b. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1) Sika Corporation, Construction Products Division; Sikaflex - 15LM.
 - 2) Tremco Incorporated; [Vulkem 921] [Dymonic FC].
 - 3) Approved equal.

2.3 LATEX JOINT SEALANTS

- A. General: For interior locations only and where movement capacity and weathering characteristics are not critical, provide manufacturer's standard one-part, nonsag,

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

mildew-resistant, paintable latex sealant of either acrylic or silicone emulsion formulation indicated that is recommended for exposed applications on interior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

- B. 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.
- C. Available Products: Subject to compliance with requirements, latex joint sealants that may be incorporated in the Work include, but are not limited to, the following:

- 1. Latex Joint Sealant Designation: LS1

- a. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.
- b. Products:
 - 1) "AC-20," Pecora Corp.
 - 2) "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
 - 3) "Tremco Acrylic Latex 834," Tremco, Inc.
 - 4) Approved equal

- 2. Latex Joint Sealant Designation: LS2

- a. Silicone Emulsion Sealant: Provide product complying with ASTM C 834 and, except for weight loss measured per ASTM C 792, with ASTM C 920 that accommodates joint movement of not more than 25 percent in both extension and compression for a total of 50 percent.
- b. Products:
 - 1) "Trade Mate Paintable Glazing Sealant," Dow Corning Corp.
 - 2) Approved equal

2.4 ACOUSTICAL JOINT SEALANTS

- A. General: Use only at interior locations as indicated on drawings.
- B. 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.

- C. Acoustical Sealant for 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, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
- D. Available Products: Subject to compliance with requirements, provide one of the following:
 - 1. Acoustical Joint Sealant Designation: AS1
 - a. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:
 - 1) Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.
 - 2) Product has flame spread and smoke developed rating of less than 25 per ASTM E 84.
 - b. Products:
 - 1) "Sheetrock Acoustical Sealant," United States Gypsum Co.
 - 2) "AC-20 FTR Acoustical and Insulation Sealant," Pecora Corp.
 - 3) Approved equal
 - 2. Acoustical Joint Sealant Designation: AS2
 - a. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.
 - b. Products:
 - 1) "BA-98," Pecora Corp.
 - 2) "Tremco Acoustical Sealant," Tremco, Inc.
 - 3) Approved equal

2.5 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size,

shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
- C. 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.

2.6 JOINT FILLERS FOR CONCRETE PAVING (Refer to Division 32)

- A. General: Provide joint fillers of thicknesses and widths indicated.
- B. Bituminous Fiber Joint Filler: Preformed strips of composition below, complying with ASTM D 1751:
 1. Asphalt saturated fiberboard.
 2. Sealants specified by Division 32.

2.7 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material 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, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. 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. Provide self-adhesive tape where applicable.

2.8 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 to joint substrates. Confirm compatibility of cleaners with adjacent surfaces prior to application.

- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. 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, 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 after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.

- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by 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 or primer 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 in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind 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.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that 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 in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs 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 sealant from surfaces adjacent to joints.
 - 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 profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.

5. Provide recessed joint configuration of recess depth, locations indicated per Figure 8C in ASTM C 1193.

G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:

1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch (10 mm). Hold edge of sealant bead 1/4 inch (6 mm) inside masking tape.
3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

I. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, 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.

3.4 CLEANING

- A. Clean off excess sealant 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 original work.

3.6 JOINT SEALANT SCHEDULE (Select from the following where indicated or required)

JOINT SEALANT SCHEDULE

DESIGNATION ON DATA SHEETS	JOINT SEALERS	DESCRIPTION OF JOINT CONSTRUCTION AND LOCATION WHERE SEALANT IS TYPICALLY APPLIED
ES-1	Multi-part Pourable Urethane Sealant	Exterior and interior horizontal joints subject to traffic such as expansion joints in tile, pavers and sidewalks.
ES-2	One-Part Neutral Cure Silicone Sealant	Exterior and interior joints in vertical surfaces of concrete and masonry; between concrete masonry and stone; between metal and concrete, mortar, or stone; interior and exterior perimeter joints of metal frames in exterior walls; exterior overhead joints. Joints which are bordered by glass.
ES-3	Multi-component Urethane Sealant	Exterior and interior joints in vertical surfaces of concrete masonry; between concrete masonry and stone; between metal and concrete, mortar, or stone; interior and exterior perimeter joints of metal frames in exterior walls; exterior overhead joints.
ES-4	One-Part Acid Curing Silicon	Exterior and interior joints in vertical surfaces of non-porous surfaces. To be used on exterior and interior perimeter frames of walls and control and expansion and window joints. Between metal to metal, glass to glass, metal to glass, travertine to travertine, cap beads on glass.
ES-5	One-Part Mildew Resistant Silicone Sealant	Interior joints in vertical surfaces of ceramic tile in toilet rooms.
LS1/LS2	Latex Sealant	Exposed interior applications.
AS1	Acoustical Sealant	Exposed interior applications.
AS2	Acoustical Sealant	Unexposed interior applications.
Notes:	<ol style="list-style-type: none"> 1. Install sealant in joints fitting descriptions and locations listed. 2. "LS1 and LS2" are for interior use only and are to be applied only if an "ES" designation is not otherwise indicated and where movement capacity and weathering characteristics are not critical. 3. Either ES2 or ES3 may be used at contractors option where recommended by manufacturer. 4. If locations are encountered that are not described above, sealant manufacturer's recommendations are to be followed. The issue is to be brought to the attention of the Architect and General Contractor in writing. The appropriate sealant shall be submitted as part of the submittal process. 	

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

END OF SECTION 079200

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 081113 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes hollow-metal work.
- B. Related Requirements:
 - 1. Section 087100 "Door Hardware".

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation 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.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.
- B. Sustainable Submittals:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Include the following:

1. Elevations of each door type, including sidelites.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.

E. 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 final Door Hardware Schedule.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.8 DELIVERY, STORAGE, AND HANDLING

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

1. Provide additional protection to prevent damage to 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 vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Amweld International, LLC.
 2. Ceco Door Products; an Assa Abloy Group company.
 3. Republic Doors and Frames.
 4. Rocky Mountain Metals, Inc.
 5. Steelcraft; an Ingersoll-Rand company.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Frames: SDI A250.8, Level 2.
1. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 16 gage up to 5' wide, 14 gage over 5' wide.
 - b. Construction: Full profile welded.
 2. Exposed Finish: Factory primed, field painted.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.4 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- C. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (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. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.5 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 metal thickness. 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. 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. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 2. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 3. 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. Head Anchors: Two anchors per head for frames more than 42 inches (1067 mm) wide and mounted in metal-stud partitions.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

5. Door Silencers: Except on weather-stripped frames, 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.
- C. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- D. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.

2.6 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; 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. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. 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. Drill and tap frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 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-rated openings, install frames according to NFPA 80.
 - b. Install frames with removable stops located on secure side of opening.
 - c. Install door silencers in frames.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 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 power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 - 4. In-Place Metal-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 - 5. 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

END OF SECTION 081113

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 081210 - INTERIOR ALUMINUM DOORS, DOOR FRAMES AND STOREFRONT FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Related Documents:

1. Provisions established within the General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

B. Section Includes:

1. Aluminum door frames for interior use.
2. [Aluminum door frames with sidelight frame components for interior use.]
3. [Aluminum OfficeFront framing system for interior use.]
4. [Aluminum and glass doors for interior use.]

1.2 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Submit for door, sidelight and OfficeFront frames.

1. Include information for factory finish, glazing gaskets, accessories and other required components.
2. Include color charts for finish indicating manufacturer's standard colors available for selection.

C. Shop Drawings: Submit schedule indicating opening identification number, frame types, dimensions, swing, label, and hardware requirements. Use same reference numbers for openings as Contract Drawings.

D. Include elevations and details indicating frame types, profiles, conditions at openings, methods and locations of anchoring, glazing requirements, hardware locations, and reinforcements for hardware, details of connections to special construction and other custom features.

E. Samples: Submit following:

1. Samples indicating quality of finish in selected colors on alloys used for Work.
2. Where normal color and texture variations are expected, include additional samples to show range of such variation.

F. Informational Submittals: Submit manufacturer's instructions.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide aluminum frames, aluminum and glass doors, and accessories produced by a single manufacturer for each type of product indicated.
- B. Manufacturer's Qualifications: Manufacturer shall demonstrate previous experience in manufacturing of interior aluminum door and OfficeFront framing for a period of not less than 10 years on comparable sized project.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver frames and doors in cartons to provide protection during transit and storage at project site.
- B. Inspect frames and doors upon delivery for damage.
 - 1. Repair minor damage to pre-finished products by means as recommended by manufacturer
 - 2. Replace frames and doors that cannot be satisfactorily repaired.
- C. Store frames and doors at project site under cover and as near as possible to final installation location. Do not use covering material that will cause discoloration of aluminum finish.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not begin installation of frames or doors until area of work has been completely enclosed and interior is protected from the elements.
- B. Maintain temperature and humidity in areas of installation within reasonable limits, as close as possible to final occupancy. If necessary, provide temperature control and ventilation to maintain required environmental conditions.

1.7 WARRANTY

- A. Warrant against defects in manufacturing of materials for a period of 2 years from date of substantial completion.
- B. Warrant framing finish against defects, including cracking, flaking, blistering, peeling, and excessive fading, chalking and non-uniformity in color for a period of 5 years.
- C. Warrant aluminum and glass doors for life of door against corner construction failure, causing wracking of door beyond acceptable tolerances.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND PRODUCTS

A. Manufacturers:

1. RACO Interior Products, Inc.
2000 Siber Road
Huston, Texas 77055
713.682.6100
800.272.7226
www.RaconInteriors.com

B. Acceptable Products:

1. [Interior Door Frames: RACO Classic Prestige fixed throat frames to accommodate wall thicknesses indicated on Drawings; ceiling height system.]
2. [Swinging Aluminum and Glass Doors: RACO Series 550, wide stile doors , having square glazing stops, and EPDM glazing gaskets, and having ADA compliant bottom rail.
 - a. Provide non fire rated with adjustable bottom rails for field adjustment.
 - b. Provide with custom horizontal and vertical mullion pattern as indicated on Drawings.
 - c. Coordinate with Architect for complete hardware in finish, as selected by Architect:
4. Sliding Aluminum and Glass Doors: Series 2000, Sliding Doors, complete with 2-1/16 inch stiles, 2-1/8 inch top rail, and 3-3/16 inch bottom rail.

2.2 MATERIALS

- A. Aluminum: Meeting requirements of ASTM B221, 6063T5 alloy, and as otherwise required to assure compliance with dimensional tolerances and maintain color uniformity. Billets shall be composed of at least 33% recycled aluminum.
- B. Anchorage Devices, Clips and Fasteners: Manufacturer's standard type, compatible with materials being secured.
- C. Accessories: As necessary for complete system.

2.3 EXTRUDED ALUMINUM FRAME AND DOOR FABRICATION

- A. Assemble all sidelights and windows with the use of clips.
- B. Do not exceed maximum size of window or door to meet applicable code requirements.
- C. Factory pre-machine door frame jambs and doors and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required, and fastened within frame with concealed screws.

2.4 FINISHES

- A. Factory finish extruded frame and door components so that all parts exposed to

view upon completion of installation are uniform in finish and color. Exposed surfaces shall be free of scratches and other serious blemishes.

- B. Clear Anodized: AA-M12C22A21, etched, medium matte, clear anodic coating.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine project conditions and verify that project is ready for work of this section to proceed. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Verify wall thickness does not exceed manufacturer's recommended tolerances of specified throat size.

3.2 INSTALLATION

- A. Comply with frame and door manufacturer's printed installation instructions and approved shop drawings. Do not attempt installation in areas where wall thickness exceeds tolerances of specified throat size.
- B. Install frames plumb and square, free from warp or twist, securely anchored to substrates with fasteners recommended by frame manufacturer. Maintain dimensional tolerances and alignment with adjacent work. Ensure joints are hairline tight and surfaces flush with adjacent components.
- C. Set all doors in correct locations as shown on the drawings, level, square, plumb and in alignment with other work in accordance with the manufacturer's installation instructions and approved shop drawings.
- D. Install glass in accordance with Section 088000.

3.3 ADJUSTING AND CLEANING

- A. Protect exposed portions of aluminum surfaces from damage by plaster, lime, acid, cement, and other contaminants.
- B. Touch up marred areas so that touch-up is not visible from a distance of 4 feet. Remove and replace frames that cannot be satisfactorily adjusted.

3.4 PROTECTION

- A. Protect as required to assure that frames and doors will be without damage until Substantial Completion.

END OF SECTION 081210

SECTION 082120 - STILE AND RAIL WOOD DOORS

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 following:
 - 1. Interior stile and rail wood doors with glazing.
- B. Related Sections include the following:
 - 1. Section 088000 "Glazing" for glass vision panels in stile and rail wood doors.
 - 2. Section 081113 "Hollow Metal Frames" for hollow metal frames for stile and rail wood and side light.

1.3 SUBMITTALS

- A. Product Data: For each type of door. Include details of construction and glazing.
 - 1. 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, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate requirements for veneer matching.
 - 3. Indicate doors to be factory finished and finish requirements.
- C. Samples for Initial Selection: For factory-finished doors.
- D. Samples for Verification: Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.
- E. Product Certificates: Signed by door manufacturers.
- F. Warranty: Special warranty specified in this Section.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain stile and rail wood glazed doors through one source from a single manufacturer.
- B. Quality Standard for Doors of Stock Design and Construction: Comply with WDMA I.S.6, "Industry Standard for Wood Stile and Rail Doors," unless more stringent requirements are specified.
 - 1. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S.6, and include panel design number if applicable.
- C. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201, for Category II materials, unless those of Category I are expressly indicated and permitted.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 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, and have warped (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Interior Doors: Five years.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Use only materials that comply with referenced quality standards unless more stringent requirements are specified.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Assemble interior doors, including components, with either dry-use or wet-use adhesives complying with ASTM D 5572 for finger joints and ASTM D 5751 for joints other than finger joints.

B. Low-Emitting Materials:

1. Provide doors made with adhesives and composite wood products that do not contain urea-formaldehyde resins.

C. Panel Products: Any of the following:

1. Particleboard made from wood particles, with binder containing no urea-formaldehyde resin, complying with ANSI A208.1, Grade M-2.
2. Medium-density fiberboard made from wood fiber, with binder containing no urea-formaldehyde resin, complying with ANSI A208.2, Grade MD.
3. Hardboard, complying with AHA A135.4.

2.2 STILE AND RAIL DOORS

A. Available Manufacturers:

1. Artistic Doors and Windows, Inc.
2. Eggers Industries; Architectural Door Division.
3. R & R Glass
4. Midwest Millwork Co.
5. ABS
6. Approved Equal prior to bid.

B. Interior Doors:

1. Grade for Transparent Finish: Custom.
2. Wood Species for Transparent Finish: Plain sliced/sliced, White Maple.
3. Glass for Openings: Uncoated, clear, fully tempered float glass, 5.0 mm thick complying with Division 08 Section "Glazing."
4. Interior Door Types: As indicated on drawings.

C. Construction, General:

1. Grade of Doors for Transparent Finish: Custom.
1. Wood Species and Cut for Transparent Finish: Plain sliced/sliced, White Maple. Retain subparagraph below if panel designs are indicated on Drawings; delete if "Basis-of-Design Product" or "(Available)Products" Subparagraph dictates panel design.
2. Panel Designs: Glazed. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Door Construction for Transparent Finish:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Stile and Rail Construction: Veneered, structural composite lumber or veneered, edge-glued, finger-jointed clear lumber. Select veneers for similarity of grain and color, and arrange for optimum match between adjacent pieces.

E. Interior Doors:

1. Stile and Rail Widths: As indicated on drawings.
2. Molding Profile: Wood, as shown on drawings.
3. Raised-Panel Thickness: Plain sawed/sliced, species as indicated on drawings.
4. Glass for Openings: Uncoated, clear, fully tempered float glass, 5.0 mm thick complying with Division 08 Section "Glazing."

2.3 FABRICATION

- A. Fabricate stile and rail wood doors in sizes indicated for Project-site fitting.
- B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
 1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/2 inch (13 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 3/8 inch (10 mm) 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.
- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W Series standards, and hardware templates.
 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- D. Glazed Openings: Glaze doors at factory with glass of type and thickness indicated, complying with Division 8 Section "Glazing." Install glass using manufacturer's standard elastomeric glazing sealant complying with ASTM C 920. Secure glass in place with removable wood stops.
- E. Glazed Openings: Trim openings indicated for glazing with solid wood moldings, with one side removable.
- F. Transom and Side Panels: Fabricate panels to match adjoining doors in materials, finish, and quality of construction.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.4 FACTORY FINISHING

- A. General: Comply with referenced quality standard's requirements for factory finishing. Finish faces and edges of doors, including mortises and cutouts.
- B. Finish wood doors at factory. Match flush wood doors.
- C. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.
 - 1. Grade: Custom.
 - 2. Finish: Manufacturer's standard finish with performance requirements comparable to AWI System TR-6 catalyzed polyurethane.
 - 3. Staining: Match flush wood doors.
 - 4. Effect: Semifilled finish.
 - 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and substrates, with Installer present, for suitable conditions where wood stile and rail doors will be installed.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install door frames level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
- B. Hardware: For installation, see Division 8 Section "Door Hardware."
- C. Install wood doors to comply with manufacturer's written instructions and with referenced quality standard, and as indicated.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3.3 ADJUSTING AND PROTECTING

- 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 08212

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Access doors and frames for walls and ceilings not provided by other Sections.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Detail fabrication and installation of access doors and frames for each type of substrate.
- C. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
 - 2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Access Panel Solutions.
 2. Babcock-Davis.
 3. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
 4. Karp Associates, Inc.
 5. Larsen's Manufacturing Company.
 6. Milcor Inc.
 7. Approved equal.
- B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- C. Flush Access Doors with Concealed Flanges:
1. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
 2. Locations: Wall and ceiling.
 3. Door Size: Minimum 16" x 20" or size as indicated on drawings.
 4. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage.
 - a. Finish: Factory finish.
 5. Metallic-Coated Steel Sheet for Door, for wet locations: Nominal 0.064 inch (1.63 mm), 16 gauge.
 - a. Finish: Factory finish.
- D. Fire-Rated, Flush Access Doors with Concealed Flanges:
1. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide frame with gypsum board beads for concealed flange installation.
 2. Locations: Wall and ceiling.
 3. Fire-Resistance Rating: Not less than that of adjacent construction.
 4. Temperature-Rise Rating: 250 deg F (139 deg C) at the end of 30 minutes.
 5. Uncoated Steel Sheet for Door: Nominal 0.036 inch (0.91 mm), 20 gage.
 - a. Finish: Factory finish.
 6. Metallic-Coated Steel Sheet for Door, at wet locations: Nominal 0.040 inch (1.02 mm), 20 gauge.
 - a. Finish: Factory finish.
 7. Frame Material: Same material, thickness, and finish as door.
 8. Hinges: Manufacturer's standard.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

E. Hardware:

1. Latch: Cam latch operated by screwdriver at non-public spaces or areas.
2. Lock: Cylinder in all public spaces or areas.
 - a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

2.3 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Frame Anchors: Same type as door face.
- E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces 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.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
 2. Provide mounting holes in frames for attachment of units to metal or wood framing.
 3. Provide mounting holes in frame for attachment of masonry anchors.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 1. For cylinder locks, furnish two keys per lock and key all locks alike.
 2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- E. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel and Metallic-Coated-Steel Finishes:
 - 1. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates 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. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

- 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 083113

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 08 7100 - DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Door hardware for swinging doors and other doors to the extent indicated.
 - 2. Electro-mechanical devices and access control components as specified herein.
- B. Related requirements:
 - 1. Section 08 1113 - Hollow Metal Doors and Frames.
 - 2. Section 08 1416 - Flush Wood Doors.
 - 3. Section 08 4313 - Aluminum-Framed Storefronts and Entrances.

1.2 REFERENCED STANDARDS

- A. American National Standards Institute (ANSI):
 - 1. International Code Council (ICC): ANSI/ICC A117.1: Accessible and Usable Buildings and Facilities, edition as adopted by local Authority Having Jurisdiction (AHJ).
 - 2. Builders Hardware Manufacturer's Association (BHMA)
 - a. ANSI/BHMA A156.1; Butts & Hinges; 2013 edition
 - b. ANSI/BHMA A156.2; Bored and Preamsembled Locks and Latches; 2011 edition
 - c. ANSI/BHMA A156.16; Auxiliary Hardware; 2013 edition
 - d. ANSI/BHMA A156.18; Materials and Finishes; 2012 edition
 - e. ANSI/BHMA A156.36; Auxiliary Locks; 2010 edition
- B. Door and Hardware Institute (DHI)
 - 1. Keying Systems and Nomenclature, 2003 edition
 - 2. Sequence and Format for the Hardware Schedule, 2001 edition

1.3 SUBMITTALS

- A. General:
 - 1. Provide submittals in accordance with Section 01 6000 - Product Requirements.
 - 2. Advise architect within the submittal package of incompatibility or issues which may detrimentally affect the work of this section.
 - 3. Submittals shall be prepared by or under the supervision of Architectural Hardware Consultant. Stamp submittals with the DHI certification seal and signature of the supervising Architectural Hardware Consultant.
 - 4. Submittal sequence: Submit product data, hardware schedule, samples, and qualification data concurrently. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in project construction schedule.

Upon approval of first submittal package, submit wiring diagrams and key schedule.

- B. Product Data: Submit manufacturer's technical product data for each item of door hardware. Highlight relevant product information such as model, function, trim, finish, options, electrical requirements, and accessories.
- C. Hardware Schedule:
 - 1. Submit hardware schedule detailing fabrication and assembly of door hardware as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 2. Format schedule complying with the vertical format in DHI's "Sequence and Format for the Hardware Schedule" publication.
 - a. Use same door numbers as found in contract documents and group doors with like hardware under a single heading.
 - b. Identify each heading with the submitted heading number and Architect's specified hardware set number.
 - c. Each heading shall include a list of applicable openings with information as follows: Architect's specified door number, to/from location, maximum door swing, handing information, door and frame sizes and materials, applicable ratings, and other information that may impact the door hardware.
 - d. Each heading shall also include complete designations of every item including: quantity per opening, manufacturer, description of item, and complete model number designating type, style, function, size, finish, fasteners, and other options required for the provision of hardware. Indicate non-standard installation requirements or mounting heights, operational narratives of electrified openings, and list related door devices specified in other sections.
- D. Wiring Diagrams: After final approval of hardware scheduled, submit details of electrified door hardware including:
 - 1. Wiring Diagrams: For power, signal, and control wiring; diagrams shall include:
 - a. Details of interface of electrified door hardware and building safety and security systems.
 - b. Elevation diagrams of each application indicating electrified hardware mounting locations, wiring raceways, as well as conductor quantity and gage.
 - c. Point to Point wiring of each electrified device including conductor type and color.
 - d. Riser diagrams where multiple openings share electrified hardware and/or equipment.
 - 2. Electrical Requirements: Provide schedule of electrified hardware devices indicating manufacturer name and model number, peak input/output amperage and voltage values, and contact current ratings. Also indicate any special requirements by hardware item manufacturer such as specific power supply or wire type requirements.

- E. Keying Schedule: Submit keying schedule detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations complying with DHI's "Keying Systems and Nomenclature" publication.
- F. Manufacturer's Templates: After final approval of the hardware schedule, 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 ensure that adequate provisions are made for locating and installing door hardware to comply with indicated requirements. Provide additional templates, template lists, hardware schedules, and product information to other trades upon request.

1.4 QUALITY ASSURANCE

- A. Qualifications
 - 1. Supplier Qualifications:
 - a. Supplier shall have documented experience in the supply of door hardware for five (5) years or for three (3) prior projects similar in scope, size, and quality. Supplier shall be a certified direct distributor and be a full sales and service organization for the manufacturer(s) listed. Supplier shall have warehousing facilities within 75 miles of the project site.
 - b. During the course of the work, supplier shall make available an Architectural Hardware Consultant (AHC) or Architectural Openings Consultant (AOC), as certified by DHI and enrolled in the DHI Continuing Education Program, to consult with contractor, architect, and owner about door hardware and keying.
 - 2. Installer Qualifications: Installer shall have documented experience in the installation of door hardware for five (5) years or for three (3) prior projects similar in scope, size, and quality. Installer shall be employee of the supplying company.
 - 3. Manufacturer Sourcing Qualifications:
 - a. Obtain each type of door hardware (hinges, latch and locksets, exit devices, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
 - b. Provide electrified hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturer's that perform electrical modifications that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction (AHJ) are acceptable
- B. Means of Egress Doors: Except where specifically allowed by applicable building codes and the authorities having jurisdiction, latches shall not require more than 15 lbf to release latch, locks shall not require use of key, tool, or special knowledge to allow egress. Doors shall unlatch/unlock to allow egress in a single motion.
- C. Accessible Doors: Provide hardware for accessible openings that complies with ANSI/ICC A117.1 requirements in addition to the accessibility requirements of the applicable building codes and as required by authority having jurisdiction. Except

as otherwise allowed by these standards, provide hardware that meets the following:

1. Operating devices shall not require tight grasping, pinching, or turning of wrist.
 2. Maximum Opening Force requirements:
 - a. Interior, Non-Fire Rated Swing Doors: 5 lbf applied perpendicular to door at latch.
 - b. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
 - c. Fire Doors: Maximum allowed by authorities having jurisdiction or minimum force required to allow door to close and positively latch.
 3. Thresholds & Sills: Provide thresholds and sills with rises exceeding 1/4 inch to have beveled slopes of not more than 1:2. Thresholds shall not exceed 1/2 inch in height.
 4. Door Closing Speed: Adjust door closer sweep periods so that, from open position of 70 degrees, door will take a minimum of 3 seconds to close to within 3 inches from latch, measured to leading edge of door.
- D. Fire Door Assemblies: Provide door hardware for fire rated openings that complies with NFPA 80 and the requirements of the AHJ. Provide only items of door hardware that are listed by a testing and inspecting agency acceptable to the AHJ for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with fire-rated door and frame labels.
1. Where exit devices are required on fire rated doors (with supplementary marking on door label indicating "Fire Door to be Equipped with "Fire Exit Hardware"), provide label on exit device indicating "Fire Exit Hardware".
 2. Provide proper latching hardware, non-flaming door closers, approved bearing type hinges, and required gasketing if not furnished with door or frame.
- E. Smoke and Draft Control Door Assemblies: Where smoke and draft control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
- F. Coordination: Coordinate layout, templating, and installation of work with other sections as required. Provide templates, product information, schedules, and diagrams required to fully coordinate the work.
1. Coordinate hardware locations and templating with the appropriate Division 08 door and frame sections.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Marking and Packaging: Package hardware items manufacturer's standard packaging, clearly marked with hardware set number correlating to door hardware schedule and architect's door number.
- B. Delivery and Acceptance: Coordinate with construction schedule and deliver packaged hardware items to place of installation (e.g. project site, fabrication shop). Upon delivery, inspect and inventory door hardware. Immediately notify supplier of defective or missing items.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Deliver keys and cores to owner by registered mail or overnight package service. Ship keys separately from cores.
- C. Storage and Handling:
1. Provide secure, dry storage area for door hardware delivered to the project site, but not yet installed. Store items on shelves or pallets to prevent damage.
 2. Control handling and installation of hardware items that are not immediately replaceable so that completion of work will not be delayed by hardware losses both before and after installation.

1.6 WARRANTY

- A. General Warranty: Warrant door hardware against defects in material and workmanship as set forth in Section 01 7000 - Execution and Closeout Requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Approved Manufacturer's: Products by manufacturers listed under acceptable substitutions may be incorporated into the work contingent upon the provided product complying with all requirements indicated within this section.

	<u>Basis of Design</u>	<u>Acceptable Substitutions</u>
1. Hinges:	Ives (IVE)	McKinney, Stanley, Hager.
2. Mechanical Locks:	Schlage (SCH) / Best (BES)	None.
3. Panic Hardware:	Von Duprin (VON)	None.
4. Cylinders & Keying:	To Be Determined (TBD)	
5. Mechanical Closers:	LCN Closers (LCN)	None.
6. Protection Plates:	Ives (IVE)	Rockwood, Hager, Trimco.
7. Door Stops & Holders:	Ives (IVE)	Rockwood, Hager, Trimco.
8. Thresholds & Gasketing:	Guard, Pemko.	Zero (ZER) National

2.2 GENERAL MATERIALS

- A. Fasteners: Provide fasteners for each hardware item and application as recommended by the hardware manufacturer. Finish of fasteners shall match adjacent hardware and shall be concealed wherever possible. Where sets indicate hardware is to be supplied with security screws, provide manufacturer's recommended fastener with a torx-drive head.

2.3 HINGES

- A. Provide knuckle hinges for exterior doors to be constructed of either stainless steel or brass with stainless steel pins. Hinges for interior doors shall be constructed of either steel or stainless steel. Provide hinge with grade, number of knuckles, and type (e.g. full mortise) as scheduled. Provide hinge with non-removable pin (NRP) at reverse-handed doors scheduled with locking hardware.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Oil-Impregnated anti-friction bearings are not acceptable – bearings shall be ball bearings constructed of hardened steel or stainless steel.
- B. Provide hinges meeting ANSI/BHMA A156 grade 1, 2, or 3 as scheduled in the hardware sets. Provide minimal hinge width required to allow hinge barrel to clear jamb and trim and allow door to swing 180 degrees. Provide hinge height and grade as follows except where hardware schedules specifically call out sizing or hinge grade:
 1. Interior Doors, up to 36 inches wide: 4-1/2 inch hinge, Grade 2
 2. Interior Doors, over 36 inches wide: 5 inch hinge, Grade 1
 3. Exterior Doors, up to 36 inches wide: 4-1/2 inch hinge, Grade 1
 4. Exterior Doors, over 36 inches wide: 5 inch hinge, Grade 1
- C. Provide a minimum of 2 hinges per door leaf. For door leaves exceeding 60 inches in height, provide a minimum of 1 hinge for every 30 inches or portion thereof.
- D. Acceptable Products:
 1. Grade 1: Ives 5BB1HW Series, McKinney T4B3386/T4B3786, Stanley FBB168/FBB199 Series, or Hager BB1168/BB1199 Series.
 2. Grade 2: Ives 5BB1 Series, McKinney TB2314/TB2714, Stanley FBB179/FBB191 Series, or Hager BB1279/1191 Series.

2.4 MECHANICAL LOCKS

- A. General:
 1. Provide locks and latches at fire rated doors with a minimum listing by UL or other testing agency as matches the required opening rating.
 2. Locks and latches shall all comply with accessibility requirements and shall not require tight grasping, pinching, or turning of the wrist.
 3. Provide keyed locks with cylinder preparations that are compatible with the cylinder / core types specified within this section.
 4. Provide locks with standard ANSI strike plates with curved lips (extended as appropriate to extend just beyond face of frame/trim).
- B. Mortise Locks: Provide mortise lock meeting or exceeding ANSI/BHMA A156.13 Grade 1 for both operational and security requirements. Provide mortise locks with large, offset type thumb turns at any applicable lock functions. Where specified at toilet rooms and other private use areas, provide occupancy indicator on outside of door reading "OCCUPIED" or "VACANT" depending on lock status. Deadbolt functions shall allow single motion egress with inside lever retracting both latch and deadbolt simultaneously.
- C. Grade 1 Cylindrical Locks: Provide locks to exceed ANSI/BHMA A156.2 Grade 1 requirements. Match existing facility locksets.
- D. Acceptable Products (World Trade Center 19 Only):
 1. Mortise Locks: Schlage L9000 Series, No Substitution.
 2. Grade 1 Cylindrical Locks: Schlage ND Series, No Substitution.
- E. Acceptable Products (Key Bank Tower 22 Only):

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Mortise Locks: Best 45H Series, No Substitution.
2. Grade 1 Cylindrical Locks: Best 9K Series, No Substitution.

2.5 PANIC HARDWARE

- A. Provide conventional push pad type exit device complying with ANSI A156.3 Grade 1. Where scheduled at doors exceeding 36 inches in width, provide device designed for wide doors. Where scheduled at fire rated doors, provide device labeled as "Fire Exit Hardware". Where required by the stile-width, provide narrow-stile type device.
- B. At openings scheduled with delayed egress, provide panic hardware with integrated 15 second delayed egress controller.
- C. Acceptable Products:
 1. Von Duprin 98 Series, No Substitution.

2.6 CYLINDERS & KEYING

- A. Keying Meeting: Prior to ordering cylinders, conduct keying meeting with owner to determine the detailed requirements of the new cylinders.
- B. Key System: Integrate new cylinders into existing facility key system as directed by owner during keying meeting.
- C. Cylinders and Keys: Provide new cylinders of type (Conventional, LFIC Core, SFIC Core) and keyway as directed by owner during keying meeting.
- D. Acceptable Products:
 1. To Be Determined.

2.7 SURFACE DOOR CLOSERS

- A. Provide surface closers certified to ANSI/BHMA A156.4 Grade 1, with non-handed body constructed of cast iron or cast Aluminum. Closers shall not utilize Pressure Relief Valves (PRV's).
 1. Provide closer with universal screw packs that include through-bolts, wood screws, and template machine screws. Do not provide self-reaming and tapping screws.
 2. Provide closer with adjustable sizing from sizes 1 to 6.
- B. Closer Mounting: Provide closer with standard tri-pack mount arm and install on room side of door.
- C. Acceptable Products:
 1. LCN 4040XP Series.

2.8 DOOR STOPS & HOLDERS

- A. Provide door stops as scheduled.
- B. Acceptable Products:
 - 1. Scheduled Ives products and their equivalent BHMA models by Rockwood, Hager, or Trimco.
 - 2. Scheduled Glynn Johnson products and their equivalent BHMA models by Rixson.

2.9 THRESHOLDS & GASKETING

- A. Where scheduled, provide the indicated gasketing with length sufficient to provide a continuous seal around the opening. Where doors and frames are provided as a pre-hung assembly, provide assembly manufacturer's standard gasketing.
- B. Provide thresholds and gasketing as scheduled or any BHMA equivalent product.

PART 3 EXECUTION

- A. General
 - 1. Install door hardware as detailed in the approved hardware schedule using only approved fasteners and in accordance with manufacturer's recommended procedures and methods.
 - 2. Install hardware and signage at fire rated openings in accordance with NFPA 80 requirements.
- B. Maximum Gap Clearance: Install doors and frames such that gap clearances do not exceed the measurements listed below for any application. These clearances comply with NFPA requirements for smoke and fire rated openings:
 - 1. Between Door and Frame Head and Jambs: 1/8 inch for wood doors, 3/16 inch for metallic doors.
 - 2. Between Paired Door Meeting Stiles: 1/8 inch.
 - 3. Door Undercut: 3/4 inch.
- C. Hardware Mounting Heights: Mount door hardware units at hollow metal door manufacturer's standard heights.
- D. Surface Mounted Door Closers: Install surface mounted door closers on room side of openings, except where prohibited by scheduled hardware. Use appropriate arms, spacers, brackets, and accessories to properly install surface mounted door closers. Adjust spring power to the appropriate setting to ensure the doors reliably close under normal operating conditions. Utilize the following installation methods to install closers:
 - 1. Metallic doors: Drill and tap holes and install closers using template machine screws. Self-drilling and tapping screws are prohibited.
 - 2. Reinforced wood doors and wood frames: Drill pilot holes and install closers using threaded to the head wood screws. Self-piloting screws are prohibited.
 - 3. Non-Reinforced wood doors: Drill holes and install closers using through bolt fasteners.

- E. Wall Mounted Door Stops And Holders
 - 1. Locate wall mounted door stops at the appropriate height and location to properly contact protruding door trim.
 - 2. Where indicated in the HW Sets, mount floor stops at exterior doors as a wall stop.
- F. Gasketing: Install gasketing to provide a continuous seal around the perimeter of the opening. Install soffit mounted hardware using the proper brackets, spacers, and accessories to allow proper installation without cutting or notching gasketing material or mounting channels.
- G. Thresholds and Saddles: Trim, cut, and notch thresholds and saddles neatly to minimally fit the profile of the door frame. Thresholds and saddles shall be set in full bed of butyl-rubber or polyisobutylene mastic sealant.

3.2 FIELD QUALITY CONTROL

- A. Architectural Hardware Consultant: Architect will engage a qualified Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
- B. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.3 ADJUSTING

- A. After building HVAC system is balanced and adjusted, conduct final adjustment of door closers. Verify spring power of the surface mounted door closer is properly adjusted to close and latch the door and to comply with the opening force requirements of ANSI A117.1 as follows:
 - 1. Doors with Closers shall take five (5) seconds to close from 90 degrees to 12 degrees.
 - 2. Interior, non-fire rated swinging doors shall open with a maximum of 5 lbs of pressure.
 - 3. Exterior doors and fire rated doors shall open with the minimum amount of pressure required to positively close and latch the door.

3.4 CLEANING AND PROTECTION

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

3.5 SCHEDULE

- A. General

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Coordinate with door schedule for specific openings assigned to each hardware set.
- B. Hardware Sets:

INTERMOUNTAIN WTC 19
 INTERMOUNTAIN KBT 22
 36 S. State Street
 Salt Lake City, Utah

SPEXTRA: 385529

HARDWARE GROUP NO. KBT-01

DOOR NUMBER(S): 2200A, 2200B

2 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-06	↗ 626	VON
1 EA	PANIC HARDWARE	RX-QEL-9827-L-DT-06	↗ 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	628	ZER
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	↗	
2 EA	DOOR POSITION SWITCH	BY DIVISION 28	↗	
1 SET	120VAC POWER	BY DIVISION 26	↗	
1 SET	REMOTE RELEASE HDWR	BY DIVISION 28	↗	
1 SET	FIRE ALARM CONTACT	BY DIVISION 28	↗	
1 SET	LOW VOLTAGE POWER	BY DIVISION 28	↗	
1 SET	MV WIRE & TERMINATIONS	BY DIVISION 26	↗	
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

1. DOOR IS NORMALLY CLOSED AND LATCHED TO PREVENT UNAUTHORIZED ENTRANCE.
2. 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.
3. INSIDE PANIC HARDWARE ALWAYS ALLOW IMMEDIATE EGRESS.
4. OUTER ACTUATOR IS DISABLED WHEN DOORS ARE LATCHED AND ENABLED WHEN LATCHES ARE RETRACTED. INNER ACTUATOR IS ALWAYS ENABLED. DEPRESSING ENABLED ACTUATOR RELEASES MAGNETIC LOCK (IF SECURE) AND THEN SIGNALS OPERATOR TO OPEN ACTIVE LEAF.
5. ON LOSS OF POWER, FIRE ALARM, OR FIRE SPRINKLER FLOW, MAGNETIC LOCK RELEASES TO ALLOW IMMEDIATE PASSAGE IN EITHER DIRECTION.

HARDWARE GROUP NO. KBT-02

DOOR NUMBER(S): 2221A

1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	POWER TRANSFER	EPT10	↗ 689	VON

INTERMOUNTAIN WTC 19
 INTERMOUNTAIN KBT 22
 36 S. State Street
 Salt Lake City, Utah

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	ELECTRIC STRIKE	6300 FSE		630	VON
1 EA	AUTOMATIC OPERATOR	SW100 SERIES	✓	628	BSM
2 EA	4.75" ACTUATOR	10PBS1	✓	630	BEA
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	RACEWAY & CONDUIT	BY DIVISION 26	✓		
1 SET	LV WIRE & TERMINATIONS	BY DIVISION 28	✓		
1 SET	WIRING DIAGRAMS	PER 087100 ARTICLE "SUBMITTALS"	✓		

OPERATIONAL DESCRIPTION

1. DOOR IS NORMALLY CLOSED AND LATCHED. OUTSIDE LEVER IS NORMALLY SECURE TO PREVENT UNAUTHORIZED ENTRANCE.
2. VALID CREDENTIAL AT READER MOMENTARILY RELEASES OUTSIDE LEVER TO ALLOW AUTHORIZED ENTRANCE.
3. INSIDE PANIC HARDWARE ALWAYS ALLOW IMMEDIATE EGRESS.
4. OUTER ACTUATOR IS DISABLED WHEN LEVER IS SECURE AND ENABLED WHEN LEVER IS RELEASED BY ACCESS CONTROL SYSTEM. INNER ACTUATOR IS ALWAYS ENABLED. DEPRESSING ENABLED ACTUATOR RELEASES ELECTRIC STRIKE AND THEN SIGNALS OPERATOR TO OPEN ACTIVE LEAF.
5. 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. KBT-03

DOOR NUMBER(S): 2201

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	RACEWAY & CONDUIT	BY DIVISION 26	✓		
1 SET	LV WIRE & TERMINATIONS	BY DIVISION 28	✓		
1 SET	WIRING DIAGRAMS	PER 087100 ARTICLE "SUBMITTALS"	✓		

INTERMOUNTAIN WTC 19
 INTERMOUNTAIN KBT 22
 36 S. State Street
 Salt Lake City, Utah

OPERATIONAL DESCRIPTION

1. DOOR IS NORMALLY CLOSED AND LATCHED. OUTSIDE LEVER IS NORMALLY SECURE TO PREVENT UNAUTHORIZED ENTRANCE.
2. VALID CREDENTIAL AT READER MOMENTARILY RELEASES OUTSIDE LEVER TO ALLOW AUTHORIZED ENTRANCE.
3. INSIDE PANIC HARDWARE ALWAYS ALLOW IMMEDIATE EGRESS.
4. 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. KBT-04

DOOR NUMBER(S): 2236A

2 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 X FL (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	628	ZER
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	↗	
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

1. DOOR IS NORMALLY CLOSED AND LATCHED. OUTSIDE LEVER IS NORMALLY SECURE TO PREVENT UNAUTHORIZED ENTRANCE.
2. VALID CREDENTIAL AT READER MOMENTARILY RELEASES OUTSIDE LEVER TO ALLOW AUTHORIZED ENTRANCE.
3. INSIDE LEVER ALWAYS ALLOWS EGRESS.
4. ON LOSS OF POWER, OUTSIDE LEVER REMAINS SECURE AND EMERGENCY ENTRANCE BY KEY IN OUTSIDE LEVER.

HARDWARE GROUP NO. KBT-05

DOOR NUMBER(S): 2211A, 2211B, 2211C, 2236B, 2242

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

INTERMOUNTAIN WTC 19
 INTERMOUNTAIN KBT 22
 36 S. State Street
 Salt Lake City, Utah

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 EA	CARD READER	BY DIVISION 28	↗	
1 SET	ACCESS CONTROL EQUIP.	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	RACEWAY & CONDUIT	BY DIVISION 26	↗	
1 SET	LV WIRE & TERMINATIONS	BY DIVISION 28	↗	
1 SET	WIRING DIAGRAMS	PER 087100 ARTICLE "SUBMITTALS"	↗	

OPERATIONAL DESCRIPTION

1. DOOR IS NORMALLY CLOSED AND LATCHED. ELECTRIC STRIKE IS NORMALLY SECURE TO PREVENT UNAUTHORIZED ENTRANCE.
2. VALID CREDENTIAL AT READER MOMENTARILY RELEASES ELECTRIC STRIKE TO ALLOW AUTHORIZED ENTRANCE.
3. INSIDE LEVER ALWAYS ALLOWS EGRESS.
4. ON LOSS OF POWER, STRIKE REMAINS SECURE AND EMERGENCY ENTRANCE BY KEY IN OUTSIDE LEVER.

HARDWARE GROUP NO. KBT-06

DOOR NUMBER(S): 2224A

	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
2 SET				
2 EA	PANIC HARDWARE	CD-9827-L-LBR-06	626	VON
2 EA	DOGGING T-TURN CYL.	09-900 NS (CAM AS REQ'D)	606	SCH
1 SET	CYLINDER(S)	AS DIRECTED BY IHC	626	TBD
2 EA	SURFACE CLOSER	4040XP HEDA TBWMS	689	LCN
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	628	ZER
2 EA	DOOR SWEEP	253 / 153 SERIES	719	ZER
1 EA	PERIMETER GASKET	188S PSA SERIES (HEAD AND JAMBS)	BK	ZER

HARDWARE GROUP NO. KBT-07

DOOR NUMBER(S): 2224B

1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	PANIC HARDWARE	CD-98-L-06	626	VON
1 EA	DOGGING T-TURN CYL.	09-900 NS (CAM AS REQ'D)	606	SCH
1 SET	CYLINDER(S)	AS DIRECTED BY IHC	626	TBD
1 EA	SURFACE CLOSER	4040XP HEDA 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	DOOR SWEEP	253 / 153 SERIES	719	ZER
1 EA	PERIMETER GASKET	188S PSA SERIES (HEAD AND JAMBS)	BK	ZER

INTERMOUNTAIN WTC 19
 INTERMOUNTAIN KBT 22
 36 S. State Street
 Salt Lake City, Utah

HARDWARE GROUP NO. KBT-08

DOOR NUMBER(S): 2212

2 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	SELF-LATCHING BOLT	FB51T / FB61T	630	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	COORDINATOR	COR X FL (MB AS REQ'D)	628	IVE
2 EA	SURFACE CLOSER	4040XP RW/PA TBWMS	689	LCN
2 EA	WALL STOP	WS406/407CCV	630	IVE
2 EA	OVERTLAPPING ASTRAGAL	383 SERIES	628	ZER
1 EA	PERIMETER GASKET	488S PSA SERIES (HEAD AND JAMBS)	BK	ZER

HARDWARE GROUP NO. KBT-09

DOOR NUMBER(S): 2216, 2217, 2223

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
1 EA	WALL STOP	WS406/407CCV	630	IVE
1 SET	SILENCERS / GASKET	BY FRAME MANUFACTURER		

HARDWARE GROUP NO. KBT-10

DOOR NUMBER(S): 2235

1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	OCC. IND. OFFICE LOCK	45H AB 15H VIN	626	BES
1 SET	CYLINDER(S)	AS DIRECTED BY IHC	626	TBD
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

HARDWARE GROUP NO. KBT-11

DOOR NUMBER(S): 2209, 2210, 2214A, 2214B, 2218, 2222, 2227, 2228, 2229, 2231, 2232, 2233, 2238, 2239, 2243, 2244, 2245

1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	PASSAGE LATCH	9K3 ON 15D	626	BES
1 EA	WALL STOP	WS406/407CCV	630	IVE
1 SET	SILENCERS / GASKET	BY FRAME MANUFACTURER		

HARDWARE GROUP NO. KBT-12

DOOR NUMBER(S): 2219

INTERMOUNTAIN WTC 19
 INTERMOUNTAIN KBT 22
 36 S. State Street
 Salt Lake City, Utah

1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	PUSH PLATE	8200 6" X 16"	630	IVE
1 EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1 EA	AUTOMATIC OPERATOR	SW100 SERIES	↗ 628	BSM
2 EA	4.75" ACTUATOR	10PBS1	↗ 630	BEA
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		
1 SET	120VAC POWER	BY DIVISION 26	↗	
1 SET	MV WIRE & TERMINATIONS	BY DIVISION 26	↗	
1 SET	RACEWAY & CONDUIT	BY DIVISION 26	↗	
1 SET	WIRING DIAGRAMS	PER 087100 ARTICLE "SUBMITTALS"	↗	

OPERATIONAL DESCRIPTION

1. DOOR IS ALWAYS PUSH/PULL AND DOES NOT LATCH.
2. BOTH ACTUATORS ARE ALWAYS ENABLED, DEPRESSING EITHER SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR.

HARDWARE GROUP NO. KBT-13

DOOR NUMBER(S): 2215

1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	PUSH PLATE	8200 6" X 16"	630	IVE
1 EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
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		

HARDWARE GROUP NO. WTC-01

DOOR NUMBER(S): 1901A, 1901B

2 SET	DOOR RAILS	BY DOOR ASSEMBLY MANUFACTURER		
2 SET	CENTER PIVOT	BY DOOR ASSEMBLY MANUFACTURER		
1 EA	MAGNETIC LOCK	10MAGLOCK5ULDS	↗ 628	BEA
2 EA	BTB DOOR PULL SET	PR 8103EZHD 10" P	630	IVE
1 EA	OH CONC. CLOSER	BY DOOR ASSEMBLY MANUFACTURER		
1 EA	AUTOMATIC OPERATOR	SW100 SERIES	↗ 628	BSM
2 EA	4.75" ACTUATOR	10PBS1	↗ 630	BEA
2 EA	WALL STOP	WS406/407CCV	630	IVE
1 EA	CARD READER	BY DIVISION 28	↗	
1 SET	ACCESS CONTROL EQUIP.	BY DIVISION 28	↗	
1 EA	PUSH TO EXIT BUTTON	BY DIVISION 28	↗	

INTERMOUNTAIN WTC 19
 INTERMOUNTAIN KBT 22
 36 S. State Street
 Salt Lake City, Utah

1 EA	MOTION SENSOR	BY DIVISION 28	↗
1 SET	120VAC POWER	BY DIVISION 26	↗
1 SET	FIRE ALARM CONTACT	BY DIVISION 28	↗
1 SET	REMOTE RELEASE HDWR	BY DIVISION 28	↗
1 SET	LOW VOLTAGE POWER	BY DIVISION 28	↗
1 SET	MV WIRE & TERMINATIONS	BY DIVISION 26	↗
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

1. DOOR IS NORMALLY CLOSED AND SECURE BY MAGNETIC LOCK TO PREVENT UNAUTHORIZED ENTRANCE. EGRESS IS ALWAYS ALLOWED IN ACCORDANCE WITH IBC PARAGRAPH 1010.1.9.8.
2. DURING PROGRAMMED OPEN TIMES, MAGNETIC LOCK REMAINS UNLOCKED TO ALLOW PUBLIC PUSH/PULL PASSAGE. OTHERWISE, EITHER VALID CREDENTIAL AT READER OR SIGNAL FROM REMOTE RELEASE SYSTEM MOMENTARILY RELEASE MAGNETIC LOCK TO ALLOW AUTHORIZED ENTRANCE.
3. MOTION ON INSIDE OF DOOR OR DEPRESSING PUSH TO EXIT BUTTON LOCATED ON WALL WITHIN 4' OF OPENING MOMENTARILY RELEASE MAGNETIC LOCK TO ALLOW EGRESS.
4. OUTER ACTUATOR IS DISABLED WHEN MAGNETIC LOCK IS SECURE AND ENABLED WHEN MAGNETIC LOCK IS RELEASED. INNER ACTUATOR IS ALWAYS ENABLED. DEPRESSING ENABLED ACTUATOR RELEASES MAGNETIC LOCK (IF SECURE) AND THEN SIGNALS OPERATOR TO OPEN ACTIVE LEAF.
5. ON LOSS OF POWER, FIRE ALARM, OR FIRE SPRINKLER FLOW, MAGNETIC LOCK RELEASES TO ALLOW IMMEDIATE PASSAGE IN EITHER DIRECTION.

HARDWARE GROUP NO. WTC-02

DOOR NUMBER(S): 1912, 1931

1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	POWER TRANSFER	EPT10	↗ 689	VON
1 EA	FSE STOREROOM LOCK	ND80_DEL RX RHO (CYL PREP AS REQ'D)	↗ 626	SCH
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	RACEWAY & CONDUIT	BY DIVISION 26	↗	
1 SET	LV WIRE & TERMINATIONS	BY DIVISION 28	↗	
1 SET	WIRING DIAGRAMS	PER 087100 ARTICLE "SUBMITTALS"	↗	

OPERATIONAL DESCRIPTION

1. DOOR IS NORMALLY CLOSED AND LATCHED. OUTSIDE LEVER IS NORMALLY SECURE TO PREVENT UNAUTHORIZED ENTRANCE.

INTERMOUNTAIN WTC 19
 INTERMOUNTAIN KBT 22
 36 S. State Street
 Salt Lake City, Utah

2. VALID CREDENTIAL AT READER MOMENTARILY RELEASES OUTSIDE LEVER TO ALLOW AUTHORIZED ENTRANCE.
3. INSIDE LEVER ALWAYS ALLOWS EGRESS.
4. 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. WTC-03

DOOR NUMBER(S): 1930, 1932

1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	STOREROOM LOCK	ND80_D RHO (CYL PREP AS REQ'D)	626	SCH
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 EA	CARD READER	BY DIVISION 28	↗	
1 SET	ACCESS CONTROL EQUIP.	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	RACEWAY & CONDUIT	BY DIVISION 26	↗	
1 SET	LV WIRE & TERMINATIONS	BY DIVISION 28	↗	
1 SET	WIRING DIAGRAMS	PER 087100 ARTICLE "SUBMITTALS"	↗	

OPERATIONAL DESCRIPTION

1. DOOR IS NORMALLY CLOSED AND LATCHED. ELECTRIC STRIKE IS NORMALLY SECURE TO PREVENT UNAUTHORIZED ENTRANCE.
2. VALID CREDENTIAL AT READER MOMENTARILY RELEASES ELECTRIC STRIKE TO ALLOW AUTHORIZED ENTRANCE.
3. INSIDE LEVER ALWAYS ALLOWS EGRESS.
4. ON LOSS OF POWER, STRIKE REMAINS SECURE AND EMERGENCY ENTRANCE BY KEY IN OUTSIDE LEVER.

HARDWARE GROUP NO. WTC-04

DOOR NUMBER(S): 1916, 1919, 1933, 1941

1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	STOREROOM LOCK	ND80_D RHO (CYL PREP AS REQ'D)	626	SCH
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	WALL STOP	WS406/407CCV	630	IVE
1 SET	SILENCERS / GASKET	BY FRAME MANUFACTURER		

HARDWARE GROUP NO. WTC-05

DOOR NUMBER(S): 1914

INTERMOUNTAIN WTC 19
 INTERMOUNTAIN KBT 22
 36 S. State Street
 Salt Lake City, Utah

1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	STOREROOM LOCK	ND80_D RHO (CYL PREP AS REQ'D)	626	SCH
1 SET	CYLINDER(S)	AS DIRECTED BY IHC	626	TBD
1 EA	SURFACE CLOSER	4040XP CUSH TBWMS	689	LCN
1 SET	SILENCERS / GASKET	BY FRAME MANUFACTURER		

HARDWARE GROUP NO. WTC-06

DOOR NUMBER(S): 1926

1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	OCC. IND. PRIVACY	L9056L 06A L583-363 L283-722	626	SCH
1 SET	CYLINDER(S)	AS DIRECTED BY IHC	626	TBD
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

HARDWARE GROUP NO. WTC-07

DOOR NUMBER(S): 1907, 1908, 1910, 1911, 1917, 1917A, 1918, 1920, 1921, 1922, 1925, 1927, 1928, 1929, 1936, 1937

1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	PASSAGE SET	ND10S RHO	626	SCH
1 EA	WALL STOP	WS406/407CCV	630	IVE
1 SET	SILENCERS / GASKET	BY FRAME MANUFACTURER		

HARDWARE GROUP NO. WTC-08

DOOR NUMBER(S): 1909A, 1909B, 1923

2 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
2 EA	PUSH PLATE	8200 6" X 16"	630	IVE
2 EA	PULL PLATE	8303 10" 4" X 16"	630	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
1 SET	SILENCERS / GASKET	BY FRAME MANUFACTURER		

HARDWARE GROUP NO. WTC-09

DOOR NUMBER(S): 1913, 1915

1 SET	INTERIOR HINGE(S)	5BB1/5BB1HW SERIES	652	IVE
1 EA	PUSH PLATE	8200 6" X 16"	630	IVE
1 EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1 SET SILENCERS / GASKET

BY FRAME MANUFACTURER

END OF SECTION 087100

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 088000 - GLAZING

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. Glass for windows, doors and storefront system framing.
 - 2. Frosted glass with Graphic Design (Manufacturer: Skylline Design).
 - 3. Glazing sealants and accessories.
- B. Related Requirements:
 - 1. Section 081433 "Stile and Rail Wood Doors."
 - 2. Section 084113 "Aluminum Framed Entrances and Storefronts."

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide plastic glazing sheets and glazing materials capable of withstanding normal temperature changes, wind, and impact loads without failure, including loss or breakage of plastic sheets attributable to the following: failure of sealants or gaskets to remain watertight and airtight, deterioration of plastic sheet and glazing materials, or other defects in materials and installation.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on plastic glazing and glazing framing members.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.6 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Review temporary protection requirements for glazing during and after installation.

1.7 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For glass.
- C. Sample Warranties: For special warranties.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project.
- B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AGC Glass Company North America, Inc.
 - 2. Guardian Industries Corp.; SunGuard.
 - 3. Northwestern Industries, Inc.
 - 4. Pilkington North America.
 - 5. PPG Flat Glass; PPG Industries, Inc.
 - 6. Vetrotech Saint-Gobain
 - 7. Skyline Design, for frosted Glass with Graphic Design.
 - 8. Approved equal.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. Safety Glazing: Where safety glazing is required, provide glazing that complies with 16 CFR 1201, Category II, IBC and indicated ASTM requirements.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6 mm thick or of thickness indicated.
 2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 3. according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 4. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
 2. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 3. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IgCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
1. Minimum Glass Thickness for Exterior Lites: 6 mm.
 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Provide Delegated Design submittal indicating performance requirements and conformance with IBC and indicated ASTM requirements. Coordinate with Window Types shown on Drawings.

2.4 GLASS PRODUCTS

A. Frosted Glass with Graphic Design: Manufacturer: Skyline Design

1. Collection: Organics
2. Pattern: Asian Grass
3. Translucency: Eco Etch / Eco-Etch Gradient
4. Glass Thickness: 1/2 inch.
5. Size: as indicated on drawings.

B. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Spacer: Manufacturer's standard spacer material and construction, unless otherwise indicated.
3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they 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, unless otherwise indicated.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. Pecora Corporation.
 - d. Sika Corporation.

2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with 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, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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 GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit 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 publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, 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 systems.
 - 3. Minimum required face and 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.
- B. Examine glazing units to locate interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

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. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. 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.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 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 (3-mm) 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.
- G. 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.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- 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. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, 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 right 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. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch 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. Installation with Drive-in Wedge Gaskets: 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. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.
- E. Protect plastic glazing from contact with contaminating substances from construction operations. If, despite such protection, contaminating substances do come into contact with plastic glazing, remove immediately and wash plastic glazing according to plastic glazing manufacturer's written instructions. Use non-abrasive materials and methods acceptable to manufacturer.
- F. Remove and replace plastic glazing that is broken, chipped, cracked, abraded, or damaged in other ways during construction period, including natural causes, accidents, and vandalism.
- G. Wash plastic glazing on both faces before date scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Wash plastic glazing according to plastic glazing manufacturer's written instructions.

3.7 MONOLITHIC GLASS SCHEDULE

- A. Glass Type: Clear tempered float glass.
 - 1. Minimum Thickness: 1/4" (6 mm).
 - 2. Safety glazing required.

3.8 INSULATING GLASS SCHEDULE

- A. Glass Type: Low-E-coated, clear insulating glass.
 - 1. Overall Unit Thickness: 1 inch (25 mm).
 - 2. Minimum Thickness of Each Glass Lite: 6 mm.
 - 3. Outdoor Lite: Heat-strengthened Solarban 60 (2) clear float glass, or equal.
 - 4. Interspace Content: Air.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

5. Indoor Lite: Heat-strengthened clear float glass.
6. Low-E Coating: Pyrolytic or sputtered.
7. Winter Nighttime U-Factor: 0.29 maximum.
8. Summer Daytime U-Factor: 0.27 maximum.
9. Visible Light Transmittance: 70 percent minimum.
10. Solar Heat Gain Coefficient: 0.39 maximum.
11. Shading Coefficient: 0.45.
12. Outdoor Visible Light Reflectance: 11%.
13. Solar Energy Transmittance: 34%.
14. Innovation in Design: MBDC Cradle-to-Cradle Certification.
15. Materials and Resources: Regional Materials, National certified network of fabricators and laminators, regional supply across the U.S.
16. Safety glazing required as indicated.

END OF SECTION 088000

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 088300 - MIRRORS

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 the following types of silvered flat glass mirrors:
 - 1. Tempered glass mirrors qualifying as safety glazing.
- B. Related Requirements:
 - 1. Section 088000 "Glazing"

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.
- C. Samples: For each type of the following:
 - 1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
 - 2. Sand Blasted Mirrors: 12 inches square, including edge treatment on two adjoining edges.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of mirror and mirror mastic.
- C. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For mirrors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing.

1. Testing is not required if data are submitted based on previous testing of mirror mastic products and mirror backing matching those submitted.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: Five years from date of manufacture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Beehive Glass Co. Inc..
 2. Dixon Mirrors and Glass Co.
 3. Glass unlimited.
 4. Sawyer Glass
 5. Approved Equivalent.
- B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.
- C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

2.2 SILVERED FLAT GLASS MIRRORS

- A. Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.
- B. Tempered Glass Mirrors: Mirror Glazing Quality for blemish requirements and complying with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear.
1. Nominal Thickness: 3/8 inch.
- C. Safety Glazing Products: For tempered mirrors, provide products that comply with 16 CFR 1201, Category II.
- D. Glass in the restrooms that is to extend below the counter is to be sand blasted so it is not reflective.

2.3 MISCELLANEOUS MATERIALS

- A. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- B. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.4 MIRROR HARDWARE

- A. Mirror Bottom Clips: As indicated
- B. Mirror Top Clips: As indicated.

2.5 FABRICATION

- A. Fabricate mirrors in the shop to greatest extent possible.
- B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment: Beveled polished edge of width shown.
 - 1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 - 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- A. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 1. Mirror Clips: Place a felt or plastic pad between mirror and each clip to prevent spalling of mirror edges. Locate clips so they are symmetrically placed and evenly spaced.
 - 2. Install mastic as follows:
 - a. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - b. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 092216 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
- 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

- B. Related Requirements:

- 1. Section 072100 "Acoustic Insulation" for batt insulation installed in stud cavities.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For dimpled steel studs and runners and firestop tracks, from ICC-ES.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 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.
- C. Wall Heights: The metal stud manufacturer is responsible to verify the required stud gauge for all applicable wall heights and applications.

2.2 FRAMING SYSTEMS (Maximum 16'-9" tall - Select from the following)

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent, unless otherwise indicated.
- B. 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. Protective Coating: G60 hot-dip galvanized unless otherwise indicated.
- C. Studs and Tracks: ASTM C 645. Use either steel studs and tracks or embossed steel studs and tracks.
 - 1. Steel Studs and Tracks:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) CEMCO; California Expanded Metal Products Co.
 - 2) MBA Building Supplies.
 - 3) MRI Steel Framing, LLC.
 - 4) Phillips Manufacturing Co.
 - 5) Steel Network, Inc. (The).
 - b. Minimum Base-Metal Thickness: 0.0451 inch.
 - c. Depth: 3-5/8 inches 6 inches (152 mm) as indicated on Drawings.
 - 2. Embossed Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally equivalent to conventional ASTM C 645 steel studs and tracks.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) CEMCO; California Expanded Metal Products Co.
 - 2) ClarkDietrich Building Systems.
 - 3) MBA Building Supplies.
 - 4) Phillips Manufacturing Co.
 - 5) Steel Network, Inc. (The).
 - b. Minimum Base-Metal Thickness: 0.0329 inch.
 - c. Depth: 3-5/8 inches 6 inches (152 mm).
 - d. Stud Spacing: 16" (405 mm) on center.
- D. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch-deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
3. 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. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
 - 2) MBA Building Supplies; FlatSteel Deflection Track or Slotted Deflecto Track.
 - 3) Steel Network Inc. (The); VertiTrack VTD Series.
 - 4) Superior Metal Trim; Superior Flex Track System (SFT).
 - 5) Telling Industries; Vertical Slip Track or Vertical Slip Track II.
 - 6) Approved equal.
- E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.
 - b. Grace Construction Products; FlameSafe FlowTrak System.
 - c. Metal-Lite, Inc.; The System.
 - d. Approved equal.
- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 1. Minimum Base-Metal Thickness: 0.033 inch unless otherwise indicated.
- G. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
 1. Depth: 1-1/2 inches unless otherwise indicated.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 1. Minimum Base-Metal Thickness: 0.033 inch.
 2. Depth: 7/8 inch.
- I. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
 1. Configuration: Asymmetrical or hat shaped.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- J. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
 - 1. Depth: 3/4 inch.
 - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch.
 - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS (Select from the following)

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire. Increase wire size as required for heavier ceiling systems.
- B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- C. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch-wide flanges.
 - 1. Depth: 1-1/2 inches.
- E. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
 - 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.033 inch.
 - b. Depth: 1-5/8 inches.
 - 3. Dimpled Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.025 inch.
 - b. Depth: 1-5/8 inches.
 - 4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base-Metal Thickness: 0.033 inch.
 - 5. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Configuration: Asymmetrical or hat shaped.
- F. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; Drywall Grid System.
 - c. USG Corporation; Drywall Suspension System.

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. Isolation Strip at Exterior Walls: Provide one of the following:
1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

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 of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 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. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
 - 2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
 - 3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. 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 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
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 no fewer than two studs at ends of arcs, place studs 6 inches o.c.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-furring members spaced 24 inches o.c.
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 o.c.
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.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c.
 2. Carrying Channels (Main Runners): 48 inches o.c.
 3. Furring Channels (Furring Members): 24 inches o.c.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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 measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 092900 - GYPSUM BOARD

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 the following, where indicated:
 - 1. Interior gypsum board.
- B. Related Requirements:
 - 1. Section 092216 "Non-Structural Metal Framing".

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 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 paper-faced gypsum panels 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 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.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. American Gypsum.
 2. CertainTeed Corp.
 3. Georgia-Pacific Gypsum LLC.
 4. National Gypsum Company.
 5. USG Corporation.
 6. Approved equal.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 1. Thickness: 5/8 inch.
 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes, select from the following where indicated:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- c. U-Bead: J-shaped; exposed short flange does not receive joint compound.
- d. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: 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 all purpose, sandable taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use all purpose, sandable taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose, sandable topping compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose, sandable topping compound.
 - 5. Skim Coat: For final coat of Level 5 finish where indicated, use drying-type, all-purpose, sandable topping compound.

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. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Laminating adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- 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 thick.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. 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.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
 - b. Grabber Construction Products; Acoustical Sealant GSC.
 - c. Pecora Corporation; AC-20 FTR.
 - d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - e. Approved equal.
 2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Thermal Insulation and Sound-Attenuation Blankets: As specified in Section 072100 "Thermal Insulation."
- F. Vapor Retarder: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, 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. Comply with ASTM C 840.
- B. 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.
- C. 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.

- D. 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.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces, 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.
- G. 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.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. 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.
- J. 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: As indicated on Drawings at vertical and horizontal surfaces.
- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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. Care must be taken to assure that the assemblies are continuous and tightly caulked between spaces.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 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. Install acoustical seals around outlets and other penetrations.
- C. Control Joints: Install control joints at locations indicated on Drawings according to ASTM C 840 and in specific locations approved by Architect for visual effect and as follows:
 1. Additional control joint requirements, Gypsum Association (GA) 216 – 2013.
 2. Control joints in the gypsum board are to be located where a partition, wall or ceiling transverses a construction joint (expansion, seismic, or building control element) in the base building structure.
 3. Control joints shall be installed where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear feet (9100 mm).
 4. Control joints in interior ceilings with perimeter relief shall be installed so that linear dimensions between control joints does not exceed 50 feet (1,500 mm) and total area between control joints does not exceed 2,500 sq. ft. (230 sq. meters).
 5. Control Joints in interior ceilings without perimeter relief shall be installed so that linear dimensions between control joints do not exceed 30 feet (9,100 mm) and the total area between control joints does not exceed 900 sq. ft. (84 sq. meters).
 6. Control joints in exterior ceilings and soffits shall be installed so that linear dimensions between control joints does not exceed 30 feet (9,100 mm) and the total area between control joints does not exceed 900 sq. ft. (84 sq. meters).
 7. A control joint or intermediate blocking shall be installed where ceiling framing members change direction.
 8. Control joints shall be installed where specified by the architect or designer as a design accent or architectural feature.
 9. Where a control joint occurs in an acoustical or fire-rated system, blocking shall be provided behind the control joint by using a backing material such as 5/8" (15.9 mm) Type-X Gypsum Board, mineral fiber, or other tested equivalent.
- D. Interior Trim: Install in the following locations:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated on Drawings.
4. U-Bead: Use at exposed panel edges where indicated.

3.5 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 for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile, panels that are substrate for acoustical tile and where indicated on Drawings.
 3. Level 3: Storage and Utility Rooms.
 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Section 099123 "Interior Painting."
 5. Level 5: Level 5 is suitable for surfaces receiving gloss and semigloss enamels and other surfaces subject to severe lighting. It is considered a high-quality gypsum board finish.
 - a. Allwall board assemblies shall receive level 5 sprayed on finish, with integral primer (on all occupied areas).

3.6 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

END OF SECTION 092900

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 093000 - TILING

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. Ceramic tile.
2. Stone thresholds.
3. Decoupling / Waterproofing membrane.

- B. Related Sections:

1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Section 092900 "Gypsum Board" for glass-mat, water-resistant backer board.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- D. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
 - 2. Full-size units of each type of trim and accessory for each color and finish required.
 - 3. Stone thresholds in 6-inch (150-mm) lengths.
 - 4. Metal edge strips in 6-inch (150-mm) lengths.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product, signed by product manufacturer.
- D. Material Test Reports: For each tile-setting and -grouting product and special purpose tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and 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.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Stone thresholds.
 - 2. Waterproof membrane.
 - 3. Crack isolation membrane.
 - 4. Joint sealants.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of each type of floor tile installation.
 - 2. Build mockup of each type of wall tile installation.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.9 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 requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has 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.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- C. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.
- D. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise 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 installation indicated 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 precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

- A. Tile Type WT-1: Porcelain Wall Tile.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Basis-of-Design Product: Daltile, Stone Attache, Haut Monde, Colorbody Porcelain, Antique.
 2. Module Size: Nominal 12 inches by 24 inches.
 3. Face: Manufacturer's standard, unless indicated otherwise.
 4. Finish: Manufacturer's standard glaze, unless indicated otherwise.
 5. Tile Color: Elite Gray #HM05, unpolished.
 6. Grout Color: As selected by Architect from manufacturer's full range.
 7. Installation Method: Axhler.
- B. Tile Type WT-2: Porcelain Wall Tile.
1. Basis-of-Design Product: Daltile, Volume 1.0m, glazed Porcelain.
 2. Module Size: Nominal 12 inches by 12 inches.
 3. Face: Manufacturer's standard, unless indicated otherwise.
 4. Finish: Manufacturer's standard glaze, unless indicated otherwise.
 5. Tile Color: Degrees Silver #VL71.
 6. Grout Color: As selected by Architect from manufacturer's full range.
 7. Installation Method: Standard Monolithic.
- C. Tile Type MT-1: Limestone Mosaic Tile.
1. Basis-of-Design Product: Daltile, Limestone Mosaic, Polished Modern
 2. Size: Irregular.
 3. Face: Manufacturer's standard, unless indicated otherwise.
 4. Finish: Manufacturer's standard glaze, unless indicated otherwise.
 5. Tile Color: Chenille White #L191.
 6. Grout Color: As selected by Architect from manufacturer's full range.
- D. Tile Type SS-1: Glazed Ceramic Wall Tile.
1. Basis-of-Design Product: Daltile, Quartzite Stacked Stone
 2. Size: Irregular
 3. Face: Manufacturer's standard, unless indicated otherwise.
 4. Finish: Manufacturer's standard glaze, unless indicated otherwise.
 5. Tile Color: Haikou Gray #S703.
 6. Grout Color: As selected by Architect from manufacturer's full range.
- E. Tile Type FT16: Porcelain Floor Tile.
1. Basis-of-Design Product: Daltile, Stone Attache, Consulate, Colorbody Porcelain, Antique.
 2. Module Size: Nominal 24 inches by 48 inches.
 3. Face: Manufacturer's standard, unless indicated otherwise.
 4. Finish: Manufacturer's standard glaze, unless indicated otherwise.
 5. Tile Color: Premier Gray #CS05; unpolished.
 6. Grout Color: As selected by Architect from manufacturer's full range.
 7. Installation Method: Ashler.
- F. Tile Type CB-1: Porcelain Cove Base.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Basis-of-Design Product: Daltile, Stone Attache, Consulate, Colorbody Porcelain, Antique
2. Module Size: 6 inches by 12 inches.
3. Face: Manufacturer's standard, unless indicated otherwise.
4. Finish: Manufacturer's standard, unless indicated otherwise.
5. Tile Color: Premier Grey #CS05, unpolished.
6. Trim Style: cove Base #S-36C9T
7. Grout Color: As selected by Architect from manufacturer's full range.

2.3 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 12 per ASTM C 1353 or ASTM C 241 and with honed finish.
 1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.4 TILE BACKING PANELS

- A. Refer to Division 09 Section "Gypsum Board".

2.5 DECOUPLING / WATERPROOFING MEMBRANE

- A. General: Manufacturer's standard product, that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Corrugated Polyethylene: Corrugated polyethylene with dovetail-shaped corrugations and with anchoring webbing on the underside; 3/16-inch (4-mm) nominal thickness.
 1. Basis of Design Product: Subject to compliance with requirements, provide the following, or a comparable approved equal product:
 - a. Schluter Systems L.P.; DITRA.
 - b. Approved equal.

2.6 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturer's:
 - a. Boiardi Products; a QEP company.
 - b. Bonsal American; an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. Laticrete International, Inc.
 - g. MAPEI Corporation.
 - h. Summitville Tiles, Inc.
 - i. TEC; a subsidiary of H. B. Fuller Company.
 - j. Approved equal.
2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.7 GROUT MATERIALS

- A. Un-sanded and Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Polymer-Modified Tile Grout: ANSI A118.7.
 1. Available Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Boiardi Products; a QEP company.
 - b. Bonsal American; an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. Laticrete International, Inc.
 - g. MAPEI Corporation.
 - h. Summitville Tiles, Inc.
 - i. TEC; a subsidiary of H. B. Fuller Company.
 - j. Approved equal.
 2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

2.8 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 079200 "Joint Sealants."

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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 extreme temperatures.
 - 1. Available Products: Subject to compliance with requirements, provide one of the following:
 - a. DAP Inc.; 100 percent Silicone Kitchen and Bath Sealant.
 - b. Dow Corning Corporation; Dow Corning 786.
 - c. GE Silicones; a division of GE Specialty Materials; Sanitary 1700.
 - d. Laticrete International, Inc.; Latasil Tile & Stone Sealant.
 - e. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
 - f. Tremco Incorporated; Tremsil 600 White.
- 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.
 - 1. Available Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc.; Chem-Calk 550.
 - b. Degussa Building Systems; Sonneborn Sonolastic SL 2.
 - c. Pecora Corporation; Dynatrol II-SG.
 - d. Sika Corporation; Sikaflex-2c SL.
 - e. Tremco Incorporated.; Vulkem 245.

2.9 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: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
- C. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
 - 1. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout or tile.
 - 1. Available Products: Subject to compliance with requirements, provide one of the following:
 - a. Bonsal American; an Oldcastle company; Grout Sealer.
 - b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer.
 - c. C-Cure; Penetrating Sealer 978.
 - d. Custom Building Products; Surfaceguard Grout and Tile Sealer.
 - e. MAPEI Corporation; 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.
 - f. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
 - g. TEC; a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone Grout Sealer.

2.10 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- 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 of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.

- b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 3. 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.
 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/8 inch per foot (1:25) toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of 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: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - b. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
 - c. Tile floors composed of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

- C. 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.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
 - 2. Paver Tile: 1/4 inch (6.35 mm).
 - 3. Glazed Wall Tile: 1/16 inch (1.6 mm).
 - 4. Decorative Thin Wall Tile: 1/16 inch (1.6 mm).
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 - 1. Do not extend decoupling / waterproofing membrane under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on [decoupling / waterproofing membrane with elastomeric sealant.
- J. Metal Edge Strips: Install at locations indicated where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
- K. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 DECOUPLING / WATERPROOFING MEMBRANE INSTALLATION

- A. Install decoupling / waterproofing membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over crack isolation membrane until membrane bonding is complete.

3.5 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. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Tile Installation F125A: Thin-set mortar on decoupling / waterproofing membrane; TCA F125A.
 - a. Tile Type: Porcelain Paver Tile.
 - b. Thin-Set Mortar: Latex-portland cement mortar.
 - c. Grout: Polymer-modified sanded grout.
- B. Interior Wall Installations, Metal Studs or Furring:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Tile Installation W245: Thin-set mortar on coated glass-mat, water-resistant gypsum backer board; TCA W245.
 - a. Tile Type: Various.
 - b. Thin-Set Mortar: Latex-portland cement mortar.
 - c. Grout: Polymer-modified unsanded grout.

END OF SECTION 093000

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes acoustical panels, Cloud trim and exposed suspension systems for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices.

1.3 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.
- C. Sustainable Submittals:
 - 1. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

- a. Include statement indicating costs for each product having recycled content.
- 2. Product Data: For sealants, including printed statement of VOC content.
- D. Qualification Data: For testing agency.
- E. Field quality-control test reports.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
- G. Research/Evaluation Reports: For each acoustical panel ceiling and components and anchor and fastener type.
- H. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- B. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
 - 2. Suspension System: Obtain each type through one source from a single manufacturer.
- C. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - b. Identify materials with appropriate markings of applicable testing and inspecting agency.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less.
- E. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
 2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings-- Seismic Zones 0-2."
 3. 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."
 4. UBC Standard 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings."
 5. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- F. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.8 COORDINATION

- A. Coordinate layout and installation of acoustical panels 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.

1.9 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. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- A. Recycled Content: Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 25 percent by weight.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
- C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- D. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING (for all areas unless noted otherwise).

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Armstrong World Industries, Inc., Ultima – Square lay-in.
 - 2. Rockfon, Rockfon Sonar dB
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type 12, Fiberglass base with membrane overlay; Form 2, water felted.
 - 2. Pattern: E (lightly textured).
- C. Color: White, unless otherwise indicated in a schedule.
- D. Edge/Joint Detail: Square lay-in
- E. Thickness: 3/4 inch. and 1 inch
- F. Modular Size: 24 inch by 24 inch; Unless otherwise indicated on drawings.
- G. Antimicrobial Treatment: fungicide and bactericide based.
- H. Provide Sag Resistance Tiles.

2.3 SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
 - 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as

determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

- a. Type: Postinstalled bonded anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
 - c. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchor.
2. Power-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 hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
 3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
 4. Size: Select wire diameter so its 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 0.135-inch- diameter wire.
- F. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- diameter bolts.
- G. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- I. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.
- 2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING
- A. Products: Subject to compliance with requirements, provide one of the following:
1. Armstrong World Industries, Inc..
- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip

galvanized according to ASTM C 635/636, not less than G60 coating designation, with prefinished 15/16-inch- wide metal caps on flanges.

1. Structural Classification: Heavy-duty system.
2. End Condition of Cross Runners: Override (stepped).
3. Face Design: Flat, flush.
4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: Painted white.
6. Wall Molding: 7/8 inch width, Beam End retaining clip

2.5 METAL EDGE MOLDINGS AND TRIM

A. Products: Subject to compliance with requirements, provide the following:

1. Armstrong World Industries, Inc.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
2. 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.

2.6 CLOUD PERIMETER TRIM

A. Products: Subject to compliance with requirements, provide the following:

1. Armstrong World Industries, Inc.; axiom 4 Inch Classic Trim.

B. Extruded aluminum perimeter trim solution for use with suspended lay-in panels. Provide a crisp edge.

1. Provide manufacturer's accessories for a complete and finished look, including corner posts, bottom trim ect.
2. Color to coordinate with the Armstrong suspension system.

2.7 ACOUSTICAL SEALANT

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

B. Products: Subject to compliance with requirements, provide one of the following:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
2. Acoustical Sealant for Concealed Joints:
 - a. OSI Sealants, Inc.; Pro-Series SC-175 Rubber Base Sound Sealant.
 - b. Pecora Corporation; BA-98.
 - c. Tremco, Inc.; Tremco Acoustical Sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with UBC Standard 25-2 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.

- b. Install panels with pattern running in one direction parallel to short axis of space, unless otherwise indicated.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.
7. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
8. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections and prepare reports:
 1. Suspended ceiling system.
 2. Hangers, anchors and fasteners.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
- C. Tests and Inspections: Testing and inspecting of completed installations of acoustical panel ceiling hangers and anchors and fasteners shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.
 1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
 - a. Within each test area, testing agency will select 1 of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every 2 postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Remove and replace acoustical panel ceiling hangers and anchors and fasteners that do not pass tests and inspections and retest as specified above.

3.5 CLEANING

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

END OF SECTION 095113

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 095114 - COLOR ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: Provide suspended ceiling acoustical ceiling panels including but not limited to:

- 1. Color Acoustical Ceiling Panel and Color Grid.

1.3 REFERENCES

- A. Abbreviations and Acronyms:

- 1. CISCA: Ceilings & Interior Systems Construction Association; www.cisca.org.

- B. Reference Standards:

- 1. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- 2. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
- 3. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
- 4. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
- 5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- 6. ASTM E1111/E1111M - Standard Test Method for Measuring the Interzone Attenuation of Open Office Components
- 7. ASTM E1414/E1414M - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meetings: Conduct meeting at Project site. Agenda includes Project conditions, coordination with work of other trades and layout of items which penetrate ceilings.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's Product data, including maintenance data.
- B. Samples: Submit 6" x 6" samples of specified ceiling panels.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Supply additional material (full-size ceiling panels) equal to 2% of ceiling area. Additional material should match Products installed and have the appropriate labels and identification.
- B. Supply extra materials that match Products installed and are packaged with protective covering for storage and identified with labels describing contents.

1.7 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect system components from excessive moisture in shipment, storage, and handling. Deliver in unopened bundles and store in a dry place with adequate air circulation.

1.9 WARRANTY

- A. Manufacturer Warranty: Submit a written warranty executed by manufacturer for a period of 30 years from date of Substantial Completion, agreeing to repair or replace suspension system components that fail or are compromised within the specified warranty period. Failed or compromised parts can include, but are not limited to:
 - 1. Rusting or defects directly made by the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Rockfon, 4849 South Austin Avenue, Chicago, IL 60638. 1-800-323-7164; www.rockfon.com.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.2 MATERIALS

- A. Acoustical Lay-in Panels: Stone wool panels, "Rockfon® Color-all™" by Rockfon® with following characteristics:
 - 1. ASTM E1264 Classification: Type XX, Pattern G.
 - 2. Edges: SQ.
 - 3. Size: 24" x 48".
 - 4. Thickness: 7/8".
 - 5. CAC: 22.
 - 6. Fire Class: Class A.
 - 7. Fire Performance:
 - a. UL 723 (ASTM E84) Flame Spread / Smoke Developed: 5/0.
 - 8. Light Reflectance: Color dependent.
 - 9. Recycled Content: Up to 40%.
 - 10. Color: Black.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine suspension assemblies, with installer present, for compliance with requirements specified in this and other Sections affecting ceiling panel installation and with requirements for installation tolerances and other conditions affecting performance of acoustic ceiling assemblies.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install ceiling panels to comply with ASTM C636/C636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

3.3 REPAIR

- A. Remove damaged or compromised components; replace with undamaged components.

3.4 CLEANING

- A. Clean exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

095426 – LINEAR WOOD CEILINGS AND WALL

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes:

1. Concealed suspension system for Wood Grille ceiling panels.
2. Wood Grille ceiling panels for concealed suspension system.
3. Trim and accessories.
4. Seismic restraints for suspended ceiling system.

1.2 REFERENCES

- A. ASTM A 641: Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire; 1992.
- B. ASTM C 423: Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 1990.
- C. ASTM C 635: Standard Specifications for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
- D. ASTM C 636: Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 1992.
- E. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials; 1991.
- F. ASTM E 580: Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint; 1991.
- G. AWI (QSI): Architectural Woodwork Quality Standards Illustrated; 2003.
- H. CISCA: Ceiling Systems Handbook.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer, approved by wood ceiling manufacturer, who has completed panel ceilings similar in species, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Inspection: All work must pass inspection and approval of architect, as well as the local codes and regulations or authorities having jurisdiction.

- C. Single-Source Responsibility for Wood Ceiling System: Obtain each type of Wood Grille ceiling panels from a single fabricator, with in-house Shop Drawing capabilities, in-house assembly and finishing capabilities, and with resources to provide products of consistent quality in appearance and physical properties without delaying the project.
- D. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying project.
- E. Pre-Installation Conference: Conduct conference at Project site.

1.4 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Samples: For verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the range of variations expected.
 - 1. 12" x 18" samples of each panel type, pattern, and color.

1.5 SHOP DRAWINGS & COORDINATION WITH OTHER TRADES

- A. Shop Drawings: Provide Shop Drawings/Coordination Drawings for all ceilings, which should include RCP and product details. Coordinate Wood Grille ceiling panels layout and installation of wood panels and suspension system components with other construction elements that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components, partition assemblies and all perimeter conditions.

1.6 PROJECT CONDITIONS

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

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery & Unloading: Coordinate crate sizes, weights, unloading options, and delivery schedule with manufacturer prior to fabrication. Deliver wood panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other mistreatment.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Acclimatization: Before installing wood panels, permit them to reach room temperature and a stabilized moisture content (at least 72 hours) per AWI standards.
- C. Handling: Handle Wood Grille ceiling panels carefully to avoid chipping edges or damaging units in any way.
- D. Protection:
 - 1. Personnel: Follow good safety and industrial hygiene practices during handling and installing of all products and systems, with personnel to take necessary precautions and wear appropriate protective equipment as needed. Read related literature for important information on products before installation. Contractor to be solely responsible for all personal safety issues during and subsequent to installation; architect, specifier, owner, and manufacturer will rely on contractor's performance in such regard.
 - 2. Existing completed work: Protect completed work above suspension system from damage during installation of suspension system components.

1.8 EXTRA MATERIALS/WARRANTIES

- A. Extra Materials: Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
 - 1. Wood Grille ceiling panels: Furnish quantity of full-size units equal to 2.0 percent of amount installed.
 - 2. Suspension System Components: Furnish quantity of each component equal to 2.0 percent of amount installed.
- B. Warranties: Provide owner with a (1) year warranty for material and workmanship on all installed products.
 - 1. Manufacturers: All materials, wood ceiling and grid, shall be warranted for (1) one year for material and workmanship.
 - 2. Installer: All work shall be warranted for (1) year from final acceptance of completed work.

PART 2 – PRODUCTS

2.1 WOOD GRILLE CEILING PANELS AND SUSPENSION SYSTEM

- A. General: The following manufacturer is basis of design:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. 9Wood, Inc. (www.9wood.com): 1300 Lay-In Grille.

2.2 WOOD GRILLE CEILING PANELS

- A. Basis of Design: 9Wood, Inc. Wood Grille, Series 1000

1. Wood Panels: 1300 Lay-In Grille, SKU 13xx-xx

- 1) Species: Species, e.g., Hemlock.
- 2) Member Size: Width x thickness, e.g., 5/8" x 1 3/8".
- 3) Edge Profile - standard: Edge Profile, e.g., "Square", "Eased".
- 4) Edge Profile – cloud: 5/8" by 1-3/8" Member "Eased and perpendicularly installed.
- 4) Members/LF: # of Members per LF, e.g., "8 Members/LF".
- 5) Assembly Style:Lay-In Backer.
- 6) Panel Sizes: Nominal size, e.g., "1' x 8' (Nom)".
- 7) Fire Rating: Fire Rating Class, e.g., Class 1(A) Fire Rating.
- 8) Finish: "Dressed-to-the-Nines"TM Clear Interior Finish.
- 9) Reveal Scrim: Reveal scrim, e.g., "Black reveal scrim".

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal T-Grid Suspension System: Provide standard interior Metal Heavy Duty 15/16" suspension T-Grid system using Main Runners, Cross-tees, Wall Angle or Shadow Moldings of types, structural classifications, and black finishes indicated and that comply with applicable ASTM C 635 requirements. Comply with all applicable seismic codes and ordinances.
- B. Attachment Devices: Size for 3 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- C. Wire, Braces, Ties, Hanger Rods, Flat Hangers and Angle Hangers: Provide wires, rods and hangers that comply with applicable ASTM specifications.

PART 3 – EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- B. Layout: Measure each ceiling area and establish the layout of Wood Grille Panel to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans in accordance with wood ceiling manufacturer's approved Shop Drawings.

3.3 INSTALLATION

- A. General: Install 9Wood, Inc. Interior Wood Grille Style 1300 to comply with manufacturer's instructions and CISCA "Ceiling Systems Handbook."
- B. Attachments: Suspend ceiling hangers from building's structural members per manufacturer's instructions and in compliance with all local codes and regulations.
- C. Installation of Metal T-Bar Grid: Install, align, brace, tie-off, mount, handle interferences, and space suspension T-Grid in accordance with suspension manufacturer's instructions and in compliance with all local codes and regulations.
- D. Installation of Wood Grille (Series 1000): Install Wood Grille ceiling panels in accordance with manufacturer's installation instructions and in compliance with all local codes and regulations. Install with undamaged edges and fitted accurately to suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit, as required.
- E. Suspension Runners: Install suspension system runners so they are square and securely interlocked with one another. Install number and use on-center spacing per wood ceiling manufacturer's instructions, as indicated on approved Shop Drawings and in compliance with all local codes.

3.4 CLEANING

- A. General: Clean exposed wood surfaces of 9Wood, Inc. Style 1300 Wood Grille ceiling panels. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace wood ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 54 26

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 096400 – WOOD TILE PAVER FLOORING

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. Factory-finished Tile Paver flooring.
 - 2. Sound control underlayment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of floor assembly and accessory. Include plans, sections, and attachment details. Include expansion provisions and trim details.
- C. Samples for Verification: For each type of wood tile paver flooring and accessory, with stain color and finish required, two (2) tile pavers and of same thickness and material indicated for the Work and showing the full range of normal color and texture variations expected.
- D. Installer qualifications.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wood tile paver Flooring: Equal to 1 percent of amount installed for each type, color, and finish of wood tile paver flooring indicated.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Installer qualifications: Minimum of one-year experience installing product of this type.

1.6 WARRANTY

- A. Manufacturer shall warrant installed tile pavers for a period of 5 years from date of substantial completion against failure of materials.
- B. Installer shall warrant installation of tile pavers for a period of 3 years from date of substantial completion against failure of workmanship.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood tile paver flooring materials in unopened cartons or bundles.
- B. Protect wood tile paver flooring from exposure to moisture. Do not deliver wood tile paver flooring until after concrete, masonry, plaster, ceramic tile, and similar wet-work is complete and dry.
- C. Store wood tile paver flooring materials in a dry, warm, ventilated, weathertight location.

1.8 FIELD CONDITIONS

- A. Conditioning period begins not less than seven days before wood tile paver flooring installation, is continuous through installation, and continues not less than seven days after wood tile paver flooring installation.
 1. Environmental Conditioning: Maintain ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants in spaces to receive wood tile paver flooring during the conditioning period.
 2. Wood tile paver Flooring Conditioning: Move wood tile paver flooring into spaces where it will be installed, no later than the beginning of the conditioning period.
 - a. Do not install flooring until it adjusts to relative humidity of, and is at same temperature as, space where it is to be installed.
 - b. Open sealed packages to allow wood tile paver flooring to acclimatize immediately on moving flooring into spaces in which it will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Install factory-finished wood tile paver flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 WOOD TILE PAVER FLOORING

- A. Manufacturer
 - 1. Tile Tech Pavers Inc.
213.380.5560
Toll Free: 888.380.5575
Tiletechpavers.com
- B. Materials.
 - 1. IPE Wood Tiles
 - 2. Size: As indicated on drawings
 - 3. Finish: Smooth Surface
- C. Pedestal System
 - 1. As indicated on drawings.

2.2 SOUND CONTROL UNDERLAYMENT (select from the following)

- A. Sound Control Underlayment: Sound reducing underlayment consisting of impact-absorbing materials. Minimum Impact Insulation Class (IIC) of 50 when tested according to ASTM E 492.
 - 1. Material: Recycled rubber, Polyurethane foam, Wood fiber complying with requirements for composite wood products.
 - 2. Thickness: 1/2 inch, unless otherwise recommended by the manufacturer or indicated on the drawings.

2.3 ACCESSORY MATERIALS

- A. As recommended by the manufacturer for application indicated.
- B. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood flooring manufacturer.
- C. Fasteners: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of wood flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, trash or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Comply with flooring manufacturer's written installation instructions.
 - 1. Determine a starting point.
 - 2. Establish a grid pattern, using chalk lines.
 - 3. Use a laser leveling device or a mason's line to determine finished elevation of the surface and height.
 - 4. Install Wood Tile flooring.
 - 5.
- B. Sound Control Underlayment: Install over vapor retarder according to manufacturer's written instructions.
- C. Solid-Wood Flooring: Blind nail or staple flooring to substrate.
 - 1. Plank Flooring: For flooring of face width more than 3 inches:
 - a. Hardwood: Install countersunk screws at each end of each piece in addition to blind nailing. Cover screw heads with wood plugs glued flush with flooring.
 - b. Softwood: Install no fewer than two countersunk nails at each end of each piece, spaced not more than 16 inches along length of each piece, in addition to blind nailing. Fill holes with matching wood filler.

3.4 PROTECTION

- A. Protect installed wood tile paver flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096400

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Resilient wall base and accessories.
- B. Related Sections include:
 - 1. Section 096519 "Resilient Tile Flooring".
 - 2. Section 096533 "Resilient ESD Rubber Tile Flooring".
 - 3. Section 096813 "Tile Carpeting".

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Submittals:
 - 1. Product Data: For adhesives, including printed statement of VOC content.
- C. Samples for Verification:
 - 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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store files on flat surfaces.

1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- 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. Resilient Wall Base and Accessories: Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 RESILIENT WALL BASE

- A. Wall Base, Basis of Design: ROPPE, Roppe Wall Base.
- B. Type (Material Requirement): TS (rubber, vulcanized thermoset).
- C. Minimum Thickness: 0.125 inch.
- D. Height: 4 inch, unless otherwise indicated.
- E. Outside Corners: Job formed.
- F. Inside Corners: Job formed.
- G. Surface: Smooth.
- H. Color: Fp;jom #129 unless otherwise indicated; See finish legend on drawings.

2.3 RESILIENT MOLDING ACCESSORY

- A. Description: Carpet edge for glue-down applications, Nosing for resilient floor covering, Reducer strip for resilient floor covering, Joiner for tile and carpet.
 - 1. Roppe Corporation, to match base, or Approved Equal.
- B. Material: Rubber.
- C. Profile and Dimensions: As indicated.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. VCT and Asphalt Tile Adhesives: 50 g/L.
 - b. Cove Base Adhesives: 50 g/L.
 - c. Rubber Floor Adhesives: 60 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates: 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. (1.36 kg of water/92.9 sq. m) 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 RESILIENT WALL BASE INSTALLATION

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

3.4 RESILIENT ACCESSORY INSTALLATION

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

3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly, Damp-mop surfaces to remove marks/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 during remainder of construction period. Use protection methods recommended in writing by manufacturer.

END OF SECTION 096530

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 096519 - RESILIENT TILE FLOORING

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. LVT; Luxury Vinyl Floor Tile.

- B. Related Sections include:

- 1. Section 096513 "Resilient Base and Accessories".
 - 2. Section 096533 "Resilient ESD Rubber Tile Flooring.
 - 3. Section 096813 "Tile Carpeting".

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

- 1. Show details of special patterns.

- C. Samples: Full-size units of each color and pattern of floor tile required.

- D. Samples for Initial Selection: For each type of floor tile indicated.

- E. Samples for Verification: Full-size units of each color and pattern of floor tile required.

- F. Product Schedule: For floor tile. Use same designations indicated on Drawings.

- G. Letter from the Manufacturer: Prior to starting work and with the shop drawing submittal, provide a letter stating that the floor is acceptable for the installation of the product. See item # 3.1.A.2 below for details.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

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

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), 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 installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 Manufacturer for LVT

- A. Basis of Design Manufacturer: Subject to compliance with requirements, provide Mannington Commercial. Coordinate with Construction Documents; see Finish Legend/schedule on drawings.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
 - 1. Adhesives shall comply with the following limits for VOC content:
 - a. Composition Tile Adhesives: 50 g/L or less.
 - 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
2. It is the General Contractor's responsibility to assure that all floor slabs are not greater than the maximum moisture content, relative humidity and other requirements of each floor finish manufacturer's product, prior to the flooring installation. If the floor slab exceeds the maximum moisture content, relative humidity and other requirements of of each floor finish manufacturer's product, the General Contractor will be responsible for the concrete slats that pose conditions affecting the performance of the finished floor, including providing proper surface preparation and surface chemical treatment as needed to provide aa concrete surface that meets the requirements or/and approval of each floor finish manufacturer's product and will be performed at no additional cost to the owner. The General Contractor will be responsible to coordinate with the floor finish manufacturer for acceptance of the measures that will be used to correct moisture content, relative humidity and other requirements od each floor finish manufacturer, prior to the flooring installation. Approval from the finish floor manufacturer is required prior to starting the installation of any flooring.

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

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions 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. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 4. Moisture Testing: See item # 3.1.A.2
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles as indicated on drawings.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain running in one direction, unless otherwise indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. 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 marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile 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.
- C. Protect floor tile from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish; Apply two coat(s).
- E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096533 - RESILIENT ESD RUBBER TILE FLOORING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Resilient ESD Vinyl Tile Flooring
- B. Related Sections: Section(s) related to this section include:
 - 1. Concrete: Refer to Division 3 Concrete Sections for cast-in-place concrete, concrete toppings, and cementitious underlayments.

1.02 REFERENCES

- A. Forbo Installation Guide
- B. Forbo Floor Care Guide
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
 - 2. ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
 - 3. ASTM F 150 Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring
- D. Federal Specification (Fed Spec):
 - 1. Fed Spec SS-T 312B Tile Floor: Asphalt, Rubber, Vinyl, Vinyl Asbestos; 10/10/1974
- E. National Fire Protection Association (NFPA):
 - 1. NFPA 99 Standard for Health Care Facilities
 - 2. NFPA 253 Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
 - 3. NFPA 258 Test Method for Specific Optical Density of Smoke Generated by Solid Materials
- F. Federal Test Standards (FTS):
 - 1. FTS 101C Method 4046 Charge Decay Time
- G. American Association of Textile Colorist & Chemists (AATCC):
 - 1. AATCC 134 Static Propensity
- H. Electrical Overstress/Electrostatic Discharge Association (EOS/ESD):
 - 1. EOS/ESD-S7.1 1994 Floor Material Resistive Characterization of Materials

- I. Standards Council of Canada
 1. CAN/ULC S102 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

1.03 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide flooring which has been manufactured, fabricated and installed to performance criteria certified by manufacturer without defects, damage, or failure.

1.04 SUBMITTALS

- A. General: Submit listed submittals.
- B. Product Data: Submit product data, including manufacturer's SPEC-DATA product sheet, for specified products.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, accessories, finish colors, patterns and textures.
- D. Samples: Submit selection and verification samples for finishes, colors, and textures.
- E. Quality Assurance Submittals: Submit the following:
 1. Manufacturers Technical Data: Manufacturers document specifying performance characteristics and criteria, and physical requirements.
 2. Manufacturer's Instructions: Manufacturer's installation instructions.
 3. Manufacturer's Field Reports: Manufacturer's field reports specified herein.
- F. Closeout Submittals: Submit the following:
 1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
 2. Warranty: Warranty documents specified herein.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
 1. Must be a Roppe approved Installer.
- B. Project Meeting:
- C. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
 - 1. Material should be stored in areas that are fully enclosed and weathertight. The permanent HVAC should be fully operational, controlled and set at a minimum of 68° F (20° C) for at least 48 hours prior to the installation.

1.07 PROJECT CONDITIONS

- A. Environmental Requirements/Conditions: In accordance with manufacturer's recommendations, areas to receive flooring should be clean, fully enclosed and weathertight. The permanent HVAC must be fully operational, controlled and set at a minimum of 68° F (20° C) for a minimum of seven days prior to, during, and seven days after the installation. The flooring material should be conditioned in the same manner for at least 48 hours prior to the installation. Areas to receive flooring shall be adequately lighted to allow for proper inspection of the substrate, installation and seaming of the flooring, and for final inspection.
- B. Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during, and after installation as recommended by manufacturer.
 - 1. Temperature Conditions: 68° F (20° C) for a minimum of seven days prior to, during, and seven days after the installation.
- C. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.08 SEQUENCING AND SCHEDULING

- A. Finishing Operations: Install tile flooring after finishing operations, including painting and ceiling operations, have been completed.
- B. Concrete Curing: Do not install tile flooring over concrete substrates until substrates have cured and are dry to bond with adhesive as determined by resilient flooring manufacturer's recommended bond testing, moisture testing, and pH testing.

1.09 WARRANTY

- A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

1. Warranty Period: Five (5) year limited warranty commencing on Date of Substantial Completion.

1.10 MAINTENANCE

A. Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals (Maintenance Materials) Section.

1. Quantity: Furnish quantity of flooring units equal to 5% of amount installed.
2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.

PART 2 PRODUCTS

2.01 RESILIENT ESD RUBBER TILE FLOORING

A. Manufacturer: .

1. Roppe Corporation
1602 N. Union Street
Fostoria, Ohio 44830-1158
(800) 537.9527
(419) 435.8546

B. Proprietary Product(s): Roppe ESD Rubber Tiles.

1. Description: tiles dissipate static electricity where static electricity presents a hazard. Creates a continuous pathway for static charges to flow to the ground point.
2. Size: Approx. 24" X 24"
3. Gauge: 2.0mm (0.080")
4. Pattern and Color: Fiesta rubber Tile; Marron #408,
5. Adhesive: ROP605
6. Welding Bead: Custom color tile matching.

2.02 PRODUCT SUBSTITUTIONS

A. Substitutions: No substitutions permitted.

2.03 RELATED MATERIALS

A. Related Materials: Refer to other sections for related materials as follows:

1. Underlayment and Patching Compound: Refer to Division 3 Concrete Sections for Portland cement based underlayments and patching compounds.
2. Resilient Flooring Accessories: Refer to Division 9 Finishes Sections for resilient flooring accessories.
3. Expansion Joint Covers: Refer to other specification section for expansion joint covers to be used with resilient flooring.

2.04 SOURCE QUALITY

A. Source Quality: Obtain flooring product materials from a single manufacturer.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.

3.02 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions (bond testing, pH testing, calcium chloride testing, relative humidity testing, etc.).
- B. Material Inspection: In accordance with manufacturer's installation requirements, visually inspect materials prior to installation. Material with visual defects shall not be installed and shall not be considered as a legitimate claim.

3.03 PREPARATION

A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.

B. Surface Preparation:

1. General: Prepare floor substrate in accordance with manufacturer's instructions.
2. Floor Substrate: Floors shall be sound, smooth, flat, permanently dry, clean, and free of all foreign materials including, but not limited to, dust, paint, grease, oils, solvents, curing and hardening compounds, sealers, asphalt and old adhesive residue.
3. Concrete Floor Substrate: Concrete floor substrate shall have a minimum compressive strength of 3,000 psi. Refer to Division 3 Concrete sections for patching and repairing crack materials and leveling compounds with Portland cement based compounds.
 - a. Reference Standard: Comply with the latest version of ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

- C. Concrete Moisture Testing: Conduct moisture tests on all concrete floors regardless of the age, grade level or the presence of existing flooring. Conduct calcium chloride tests in accordance with the latest version of ASTM F 1869. Measure the internal relative humidity of the concrete slab in accordance with the latest version of ASTM F 2170. One test of each type should be conducted for every 1,000 square feet of flooring (minimum of 3). The tests should be conducted around the perimeter of the room, at columns, and anywhere moisture may be evident. Concrete moisture vapor emissions must not exceed 8.0 lbs. per 1,000 square feet in 24 hours when using Forbo C 930 adhesive. Concrete internal relative humidity must not exceed 85% when using Forbo C 930 adhesive. A diagram of the area showing the location and results of each test should be submitted to the Architect, General Contractor or End User. If the test results exceed these limitations, the installation must not proceed until the problem has been corrected.
- D. Concrete pH Test: Perform pH tests on concrete floors regardless of the age or grade level. The surface pH of concrete slabs must not exceed a pH of 10. Concrete substrates with pH readings less than 7.0 or above 10.0 will require remediation prior to installation.

3.04 INSTALLATION

- A. Material Installation: Copy with flooring manufacturer's complete installation instructions for installation.
- B. Adhesive Installation: Provide as recommended by flooring manufacturer for specific adhesive including spread rate.
- C. Finish Flooring Patterns: standard Monolithic.

3.05 FIELD QUALITY REQUIREMENTS

- A. Manufacturer's Field Services: Upon Owner's request and with at least 72 hours' notice, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.
 - 1. Site Visits: one site visits.

3.06 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
 - 1. Remove visible adhesive and other surface blemishes using cleaning methods recommended by floor manufacturer.
 - 2. Sweep and vacuum floor after installation.
 - 3. Do not wash floor until after time period recommended by flooring manufacturer.
 - 4. Damp mop flooring to remove black marks and soil.

3.07 PROTECTION

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- A. Protection: Protect installed product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of Substantial Completion.

3.08 INITIAL MAINTENANCE PROCEDURES

- A. General: Include in Contract Sum Amount cost for initial maintenance procedures, and execute procedures after flooring installation for a period of 1 year.
- B. Initial maintenance to be conducted by awarded Flooring Contractor using a Certified Forbo Floor Care Technician.

END OF SECTION

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 096813 - TILE CARPETING

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 This specification section includes:

- A. Modular Carpet Tiles.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show patterns; adjacent building construction, such as walls and partitions, columns, casework, and cutouts; and transition details.
- C. Samples: For each of the following products and for each color and texture required.

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. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.7 FIELD CONDITIONS

- A. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.8 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
 - 3. Warranty Period: Lifetime commercial limited from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Shaw Contract.
- B. Style: Coordinate with Contract Documents; see Finish Legend/Schedule.
- C. Applied Treatments:
 - 1. Applied Soil-Resistance Treatment: Manufacturer's standard material.
 - 2. Antimicrobial Treatment: Manufacturer's standard material.
 - a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 - a. In-Situ Probe Test: Test for moisture by relative humidity probe and digital meter method according to ASTM F 2170. Proceed with installation only after substrates have a maximum relative-humidity-measurement reading of 70 to 75 percent in 72 hours.
 2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Comply with manufacturers instruction for installation.

END OF SECTION 096813

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 097200 - 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. Vinyl Wall Covering.
- B. Related Sections:
 - 1. Section 099123 "Interior Painting"

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
- B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement, and veneer matching, seams and termination points.
- C. Samples for Verification: Full width by 36-inch-long section of wall covering.
 - 1. Sample from same print run or dye lot to be used for the Work, with specified paint applied. Mark top and face of fabric.
 - 2. Sample from same flitch to be used for the Work, with specified finish applied.
- D. Product Schedule: For wall coverings. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for wall covering.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials 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, full-size units equal to **5** percent of amount installed (except for custom design).

1.7 QUALITY ASSURANCE

- 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: As follows, per ASTM E 84:
 - a. Flame-Spread Index: 5 or less.
 - b. Smoke-Developed Index: 35 or less.
- B. 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 mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F 1141.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PROJECT 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 occupancy levels during the remainder of the construction period.
- B. Lighting: Do not install wall covering until a permanent level of lighting 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Low-Emitting Materials: Wall covering system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 WALL COVERINGS

- A. General: Provide rolls of each type of wall covering from same print run or dye lot.

2.3 VINYL WALL COVERING

- A. Fabric Backed Vinyl Wall-Covering Standards: Provide mildew-resistant products complying with the following:
 - 1. Basis of Design: Provide MAHARAM, Pattern: "Nook 399913", Color: "Rock 004".
- B. Width: 54 inches.
- C. Backing: Polyester/Cotton Osnaburg.

2.4 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining, adhesive, for use with specific wall covering and substrate application; as recommended in writing by wall-covering manufacturer.
 - 1. Adhesive shall have VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Primer/Sealer: Mildew resistant, complying with manufacturer's.
- C. Wall Liner: Nonwoven, synthetic underlayment and adhesive as recommended by wall-covering manufacturer.
- D. Seam Tape: As recommended in writing by wall-covering manufacturer.

2.5 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.

2.6 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. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity. Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 3. Metals: If not factory primed, clean and apply metal as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 4. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 5. 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. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.
- F. Install wall liner, with no gaps or overlaps, where required by wall-covering manufacturer. Form smooth wrinkle-free surface for finished installation. Do not begin wall-covering installation until wall liner has dried.

2.7 INSTALLATION

- A. General: Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated except where more stringent requirements apply.
- B. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.
- C. Install strips in same order as cut from roll.
- D. Install reversing every other strip, unless otherwise recommended by the manufacturer..
- E. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.
- F. 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. No horizontal seams are permitted.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- G. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.
- H. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

2.8 CLEANING

- A. Remove excess adhesive at finished 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 097200

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 099123 - PAINTING

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 surface preparation and the application of paint systems on the following interior substrates:
 - 1. Gypsum board.
 - 2. Walls in Wet areas; Janitor closets and Restrooms
- B. Related Sections include the following:
 - 1. Section 055000 "Metal Fabrications.
 - 2. Section 081113 "Hollow Metal Doors and Frames.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Submittal:
 - 1. Product Data: For paints, including printed statement of VOC content and chemical components.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements indicated in the schedule below, acceptable manufacturers are:

1. Sherwin Williams
2. Approved equal.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:

1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1,2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.
 - p. Isophorone.
 - q. Lead.
 - r. Mercury.
 - s. Methyl ethyl ketone.
 - t. Methyl isobutyl ketone.
 - u. Methylene chloride.
 - v. Naphthalene.
 - w. Toluene (methylbenzene).
 - x. 1,1,1-trichloroethane.
 - y. Vinyl chloride.

C. 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)].

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

D. Colors: As indicated in Finish Schedule.

2.3 PAINT SCHEDULE

A. Interior Gypsum Wallboard Walls (all walls unless noted otherwise)

1. Interior Latex Primer/Sealer: 1st Quality Zero VOC.
 - a. ProMar 200 Zero VOC Interior Latex Primer, B28W2600 0 g/L VOC.
 - b. 1.5 mill DFT each coat
 - c. VOC Rule: Less than 100 g/L
2. First and Second top coat: Interior 1st Quality Zero VOC, Gloss Level 2
 - a. ProMar 200 Zero VOC Eg-Shel (Satin Finish) B26-2600 series, 0 g/L VOC
 - b. 1.5 mill DFT each coat
 - c. VOC Rule: Less than 100 g/L

B. Interior Wet Areas (Restrooms, Locker rooms, Janitor Closet)

1. Interior Latex Primer/Sealer: 1st Quality Zero VOC.
 - a. ProMar 200 Zero VOC Interior Latex Primer, B28W2600 0 g/L VOC.
 - b. 1.5 mill DFT each coat
 - c. VOC Rule: Less than 100 g/L
2. Top coat: Epoxy-Modified Latex, Interior, gloss, Gloss Level 5
 - a. Pro Industrial Zero VOC Water-Based Epoxy Gloss, B73-300 series, <50 g/L VOC.
 - b. 1.5 mill DFT each coat
 - c. VOC Rule: Less than 100 g/L

C. Interior for ceiling or soffit of Gypsum Board

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Interior Latex Primer/Sealer: 1st Quality Zero VOC.
 - a. ProMar 200 Zero VOC Interior Latex Primer, B28W2600 0 g/L VOC.
 - b. 1.5 mill DFT each coat
 - c. VOC Rule: Less than 100 g/L
2. First and Second top coat: Interior Latex, Gloss Level 1 (flat finish) MPI #118
 - a. Low VOC Waterborne Acrylic Dryfall, Flat B42W81
 - b. 1.5 mill DFT each coat
 - c. VOC Rule: Less than 150 g/L

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

- C. Patch and repair as required by manufacturer.
- D. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- F. Galvanized-Metal Substrates: Comply with AST Standard D6386 "Preparation of Zinc (hot dipped galvanizing) coated Iron and steel Product and Hardware surfaces for Painting". Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- H. Concrete Floor Substrates: Follow concrete surface preparation procedures as detailed standard in SSPC SP-13/NACE 6, Grinding preferred to a CSP-1 or 80 grit profile. New Concrete must be cured at least 30 days before applying any product. Surface shall be free of laitance, form release agents, curing agents, oil grease and other penetrating contaminants in accordance with method ASTM D 4259. If mechanical abrasion cannot be used, method ASTM D 4260 describes the use of acids to prepare concrete surfaces for coating. Horizontal surfaces should be tested for moisture using either ASTM D 4263 Plastic Sheet Method or a calcium chloride dome test. Vertical surfaces should be tested using a Delmhorst type moisture tester.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Architect/Engineer or Owner's Representative reserves the right to direct Contractor to stop applying paints at any time and as often as deemed necessary during the period when paints are being applied when noncomplying-paint materials are found to being used.
 - 1. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Contracting Officer, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 099120

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 10 11 00 - VISUAL DISPLAY BOARDS

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes:

1. Magnetic Dry-erase Glassboards (Frameless, Concealed hardware and Huddle Board)

1.2 SUBMITTALS

A. Product Data: Provide technical data for products specified.

B. Shop Drawings: Provide shop drawings for each type of visual display board specified, including section details indicating trim, face, core, and backing materials, wall elevations, dimensions, joint locations between panels exceeding maximum panel length and anchor and installation details

C. Product Samples: Submit manufacturer's color chart showing the full range of colors available for the following:

1. Glassboard: 12" X 12" Sample to illustrate material, finish, color, and configuration of each type of glassboard required

D. Contract Closeout Submittals:

1. Maintenance Data: Manufacturer's cleaning and maintenance instructions covering both routine (daily or weekly) and long term (yearly or longer) operations
2. Warranty: Executed copy of manufacturer's warranty

1.3 DELIVERY, STORAGE AND HANDLING

A. Shipping, Storage and Protection:

1. All Glass Shipments shall arrive in custom built Wood Crates, suitable for shipping glass on standard LTL shipments in the continental US without damage to product.
2. Store factory framed or unframed units vertically with packaging materials between each unit to prevent damage
3. Store materials in dry areas at temperatures above 55° F

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify field measurements before fabrication to ensure proper fitting. Coordinate fabrication, delivery and installation schedule with Client Representative. Notify Client Representative of any conflicts with other

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

construction such as casework, electrical switches, outlets, clocks, mechanical openings, fire detector devices, etc.

- B. Environmental Requirements: Install only when the building is enclosed and interior air and substrate temperatures are stable and approximate design conditions.
- 1.5 WARRANTY
- A. Glass Writing Surface Warranty:
Submit a written warranty executed by the manufacturer agreeing to replace glassboards that discolor due to cleaning, staining or regular use.
And further guarantee the integrity of the adhesive and concealed mounting clip against delamination from either and/or both the back painted or magnetic metal plate surface of the glass.
 - 1. Warranty Period: Minimum (10) years from date of completion

PART 2- PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Clarus Glass boards Magnetic glass Boards are based on Clarus Float with "Box" marker storage unit. 7537 Jack Newell Blvd., Fort Worth, Texas 76118; 888.813.7414.

2.2 MAGNETIC GLASSBOARDS- FRAMELESS

- A. Magnetic Glassboards: Dry-erase glassboards for marker pens and rare earth magnets
 - 1. Face Sheet: Starphire low-iron oxide, tempered glass with flat polished glass edges, Back Painted Color as specified to create a totally opaque writing board
 - 2. Range:
 - a. Glass Thickness: 1/4", PPG Starphire Tempered Safety Writing Glass.
 - b. Magnetic Plate: yes.
 - c. Maximum dimension varies according to weight and Fabrication Process, 300lbs Max
 - 3. Sizes: As indicated in Drawings
 - 4. Frame Profile: Frameless Board
 - 5. Mounting Hardware: For unframed magnetic glassboards, shall be back mounted float concealed hardware. and Huddle Board support for unframed magnetic glass boards, shall be a 3form Versa partition with powder coated bar profiles with side-supported pressure fit claps.
 - 6. Accessories:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Accessory Tray:
- b. Square Magnets; set of 3 per board.

7. Board Color: As selected by Architect from Manufacturer's full range of colors.

2.3 FABRICATION

- A. Glass Markerboards shall be made using a coating applied to an unexposed surface of glass as an opacifier, resulting in a writable surface. Coatings must be applied in a smooth and even method over the entire surface, with no visible overspray or pinholes. 1mm steel backer shall be laminated to the glass panel to provide magnetic properties. All edges of an unframed glassboard shall be flat polished.
- B. Assembly: Provide factory-assembled magnetic glass writing board units, as required. Magnetic glass writing boards shall be delivered in a single panel up to manufacturer's maximum size to the job site for installation using concealed fasteners. Oversized boards should be installed side by side with 1/8" reveal between each board and installed directly to the wall using concealed fastening systems recommended by the manufacturer. Joints should be as follows:
 - 1. Make joints only where total length/height exceeds maximums. Fabricate minimum number of joints, balanced around center of board, coordinate with Architect for approval.
 - 2. Provide manufacturer's standard vertical butt joint system between abutting sections of writing boards – Standard 1/8" reveal between each board and surrounding millwork for unframed glassboards.
 - 3. Provide manufacturer's standard vertical trim at joints between framed glassboards – Maximum 12mm (1/2") wide H-Profile with finish to match frame.

2.4 FINISHES

- A. Custom color tolerance to be within one delta E (CIE LAB @ D65 10°) (ASTM D 2244)
- B. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes
- C. Manufacturer's Standard finishes as designated above

PART 3- EXECUTION

3.1 EXAMINATION

- A. Examine wall surfaces, with installer present, for compliance with requirements and other conditions affecting visual display board/rail installation

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Verify flat wall surfaces for proper board installation; provide concealed shims as necessary within Architect's acceptable variance. Minimum Level 4 finished wall required by contractor.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected

3.2 INSTALLATION

- A. Deliver factory built visual display boards, completely assembled in one piece without joints, where possible.
- B. Install units in locations and mounting heights as indicated on drawings and according to manufacturer's written instructions. Keep perimeter lines straight, plumb and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim and accessories necessary for complete installation.

3.3 CLEANING

- A. Clean units according to manufacturer's written instructions.
- B. Cover surface of all units with protective cover taped to frame.
- C. Remove protective covers and tape on date of Substantial Completion.

END OF SECTION

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 101423 - PANEL SIGNAGE

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. Room-identification signs and ADA signs as indicated on Drawings.

- B. Related Requirements:

- 1. Section 101419 "Dimensional Letter Signage".
 - 2. Division 22 "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
 - 3. Division 23 "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
 - 4. Division 26 "Interior Lighting" for illuminated, self-luminous, and photoluminescent exit sign units.

1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: For panel signs.

- 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.

3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
1. Panel Signs: Not less than 12 inches (300 mm) square, including corner.
 2. Room-Identification Signs: Full-size Sample.
 3. Field-Applied, Vinyl-Character Signs: Full-size Sample of characters on glass.
 4. Variable Component Materials: Minimum 8-inch (200-mm) Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
 5. Exposed Accessories: Full-size Sample of each accessory type.
- 1.6 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer and manufacturer.
 - B. Sample Warranty: For special warranty.
- 1.7 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For signs to include in maintenance manuals.
- 1.8 QUALITY ASSURANCE
- A. Installer Qualifications: Manufacturer of products or an entity that employs installers and supervisors who are trained and approved by manufacturer.
- 1.9 FIELD CONDITIONS
- A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.
- 1.10 WARRANTY
- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 SIGNS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. APCO Graphics, Inc.
 2. ASI Sign Systems, Inc.
 3. Best Sign Systems Inc.
 4. Clarke Systems.
 5. Mohawk Sign Systems.
 6. Vomar Products, Inc.
 7. Qualified approved equal local sign company.
- B. Room-Identification Sign AND ADA Signs: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 1. Provide the following, unless otherwise indicated.
 2. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated over subsurface graphics to acrylic backing sheet to produce composite sheet.
 - a. Composite-Sheet Thickness: Manufacturer's standard for size of sign.
 - b. Surface-Applied Graphics: Applied photo image.
 - c. Subsurface Graphics: Reverse halftone or dot-screen image.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- d. Composite-Sheet Thickness: Manufacturer's standard for size of sign.
 - e. Subsurface Graphics: Reverse etch image.
 - f. Color(s): As selected by Architect from manufacturer's full range.
3. Mounting: Manufacturer's standard method for substrates indicated.
 4. Text and Typeface: Accessible raised characters and Braille, typeface as selected by Architect from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color.
 5. Sign locations are indicated on Drawings for blocking and backing for sign anchoring.

2.3 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. For exterior exposure, furnish stainless-steel or hot-dip galvanized devices unless otherwise indicated.
 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant one-way-head slots unless otherwise indicated.
 4. Sign Mounting Fasteners:
 - a. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.

2.4 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace signs for stability and for securing fasteners.
6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.5 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

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 signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Room-Identification Signs and Other Accessible Signage: In locations on walls as indicated on Drawings and according to ADA Accessibility standards.
- C. Mounting Methods:
1. Mount exterior and interior signs on posts and walls as indicated on Drawings.
 2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 102113 - STAINLESS-STEEL TOILET COMPARTMENTS

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 stainless-steel toilet compartments configured as toilet enclosures and urinal screens.
- B. Related Requirements:
 - 1. Section 061053 "Miscellaneous Rough Carpentry" for blocking, overhead support of floor-and-ceiling-anchored compartments.
 - 2. Section 102800 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

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 toilet compartments.
- B. Shop Drawings: For toilet compartments.
 - 1. Include plans, elevations, sections, details, and attachment details.
 - 2. Show locations of cutouts for compartment-mounted toilet accessories.
 - 3. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
 - 4. Show locations of centerlines of toilet fixtures.
 - 5. Show locations of floor drains.
- C. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
 - 1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
 - 2. Each type of hardware and accessory.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of toilet compartment.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 STAINLESS-STEEL TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Accurate Partitions Corp.; ASI Group.
 - 2. Ampco Products, LLC.
 - 3. Bradley Corporation.
 - 4. General Partitions Mfg. Corp.
 - 5. Marlite.
 - 6. Metpar Corp.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Toilet-Enclosure Style: Overhead braced.
- C. Urinal-Screen Style: Wall hung with integral flanges.
- D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Provide with no-sightline system. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.
 - 1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.
 - 2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units of size and material adequate for panel to withstand applied downward load on grab bar of at least 250 lbf, when tested according to ASTM F 446, without deformation of panel.
 - 3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.
- E. Urinal-Screen Construction:
 - 1. Integral-Flange, Wall-Hung Urinal Screen: Similar to panel construction, with integral full-height flanges for wall attachment, and maximum 1-1/4 inches thick.
- F. Facing Sheets and Closures: Stainless-steel sheet of nominal thicknesses as follows:
 - 1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.038 inch.
 - 2. Panels: Manufacturer's standard thickness, but not less than 0.038 inch.
 - 3. Doors: Manufacturer's standard thickness, but not less than 0.031 inch.
 - 4. Flat-Panel Urinal Screens: Thickness matching the panels.
 - 5. Integral-Flange, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than 0.031 inch.
- G. Pilaster Shoes: Stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.
- H. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.
- I. Stainless-Steel Finish: No. 4 bright, directional polish on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
 - 1. Hinges: Manufacturer's minimum 0.062-inch-thick stainless steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through-bolts.
 - 2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts. (This may have to be a 3rd party part if the manufacturer does not have a heavy-duty parts.
 - 3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
 - 4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
 - 5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel anchors compatible with related materials.

2.4 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Brass Castings: ASTM B 584.
- D. Brass Extrusions: ASTM B 455.
- E. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- F. Stainless-Steel Castings: ASTM A 743/A 743M.
- G. Zamac: ASTM B 86, commercial zinc-alloy die castings.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories and solid blocking within panel where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Door Size and Swings: 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 designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
 - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

SECTION 102600 - WALL AND DOOR PROTECTION

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. End Wall Guards.
 - 2. Corner Guards.

1.3 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.
- B. Shop Drawings: For each protection unit showing locations and extent. Include sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: For each type of impact-resistant wall protection unit indicated.
 - 1. Include similar Samples of accent strips and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below. Include Samples of accent strips to verify color selected.
 - 1. End Wall and Corner Guards: 12 inches long. Include examples of joinery, corners, end caps, top caps, and field splices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Material Certificates: For each impact-resistant plastic material, from manufacturer.
- C. Material Test Reports: For each impact-resistant plastic material.
- D. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wall Covers: Full-size metal covers of each type, color, and texture of units installed, provide two, 8-foot long units.
 - 2. Corner-Guard Covers: Full-size metal covers of each type, color, and texture of units installed, provide two, 4-foot long units.
- B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Section 014000 "Quality Requirements."
- D. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- E. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
 - 2. Keep plastic sheet material out of direct sunlight.
 - 3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg.
 - a. Store corner-guard covers in a vertical position.
 - b. Store wall-guard covers in a horizontal position.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of plastic and other materials beyond normal use.
 - 2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M.
- B. Fasteners: Nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 CORNER GUARDS / END WALL GUARDS

- A. Surface-Mounted, Metal, Corner and End-Wall Guards: Fabricated from one-piece, formed or extruded metal that covers corners and entire end of wall; with formed edges.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Floor Products Co., Inc.
 - b. Approved equal.
 - 2. Material: Stainless steel, Type 304.
 - a. Thickness: Minimum 0.0625 inch (1.6 mm).
 - b. Finish: Directional satin, No. 4.
 - 3. Wing Size: Nominal 1-1/2 by 1-1/2 inches and full width as indicated.
 - 4. Corner Radius: 1/8 inch.
 - 5. Mounting: Oval head, countersunk screws through factory-drilled mounting holes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine walls to which impact-resistant end wall and corner protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For impact-resistant end wall and corner protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. General: Install metal end wall and corner protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

3.4 CLEANING

- A. Immediately after completion of installation, clean stainless steel covers and accessories using water and cleaning agent recommended by manufacturer.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

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. Public-use washroom accessories.
- 2. Childcare accessories.
- 3. Underlavatory guards.
- 4. Custodial accessories.

- B. Related Sections:

- 1. Section 061053 "Miscellaneous Rough Carpentry" for blocking for anchoring wall mounted accessories.
- 2. Section 088300 "Mirrors".

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:

- 1. Construction details and dimensions.
- 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
- 3. Material and finish descriptions.
- 4. Features that will be included for Project.
- 5. Manufacturer's warranty.

- B. Samples: Full size, 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. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

- 1. Identify locations using room designations indicated.
- 2. Identify products using designations indicated.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.7 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for 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.

1.8 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIAL STANDARDS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Basis-of-Design Products: Subject to compliance with requirements, provide product indicated on Drawings or comparable approved equal product by one of the following:
 - 1. A & J Washroom Accessories, Inc.
 - 2. American Specialties, Inc.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation.
 - 5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
 - 6. Tubular Specialties Manufacturing, Inc.
- B. Toilet Tissue (Roll) Dispenser:
 - 1. Basis-of-Design: Bradley Corporation, Single Jumbo Roll Toilet Tissue Dispenser Model # 5831.
 - 2. Surface mounted.
 - 3. Finish: Stainless Steel.
- C. Toilet Seat Cover Dispenser:
 - 1. Basis-of-Design: Low Capacity Surface-Mounted Seat Cover.
 - 2. Mounting: Counter-top mounted.
 - 3. Finish/Color: Chrome
 - 4.
- D. Paper Towel Dispenser and Waste Receptacle:
 - 1. Existing, to be removed for reuse by the trade furnishing Toilet Room accessories.
 - 2. To be installed by the trade furnishing Toilet Room accessories.
- E. Liquid-Soap Dispenser:
 - 1. Basis-of-Design: ELKAY, Elkay Soap/Lotion Dispenser, #LKGT1054.
 - 2. Mounting: Counter-top mounted.
 - 3. Finish/Color: Chrome

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

F. Grab Bars:

1. Basis-of-Design Product: As indicated on Drawings.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, Stainless Steel No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. Outside Diameter: Manufacturer's standard.
5. Configuration and Length: As indicated on Drawings.

G. Sanitary-Napkin Disposal Unit:

1. Basis-of-Design Product: As indicated on Drawings.
2. Mounting: Partition mounted and surface mounted where indicated.
3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

2.3 UNDERLAVATORY GUARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.
3. Approved equal.

B. Underlavatory Guard:

1. Basis-of-Design Product: As indicated on Drawings.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.4 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 104413 - FIRE EXTINGUISHER CABINETS

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. Fire protection cabinets for the following:
 - a. Portable fire extinguishers.
- B. Related Sections:
 - 1. Section 104416 "Fire Extinguishers."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
 - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
 - 2. Show location of knockouts for hose valves.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Initial Selection: For each type of fire protection cabinet indicated.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Size: 6 by 6 inches square.
- E. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. 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.
- C. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to fire protection cabinets including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.6 COORDINATION

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated.
- C. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.7 SEQUENCING

- A. Apply vinyl lettering on field-painted, fire protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.2 FIRE PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Basis of Design Product: Subject to compliance with requirements, provide Larsen's Manufacturing Company, solid door cabinet with Larson-Loc, or a comparable cabinet from one of the following available manufacturers:
 - a. J. L. Industries, Inc., a division of Activar Construction Products Group.
 - b. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
 - c. Approved equal.
- B. Cabinet Construction: Nonrated, where indicated; 1-hour fire rated, where required.
 - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: Cold-rolled steel sheet.
 - 1. Shelf: Same metal and finish as cabinet.
- D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - 1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
- E. Cabinet Trim Material: Steel sheet.
- F. Door Material: Steel sheet.
- G. Door Style: Center glass panel with frame.
- H. Door Glazing: Tempered break glass.
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide recessed door pull and friction latch.
 - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- J. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
4. Door Lock: Cylinder lock, keyed alike to other cabinets.
5. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Silk-screened.
 - 3) Lettering Color: White.
 - 4) Orientation: Vertical.
6. Alarm: Manufacturer's standard alarm that actuates when fire-protection cabinet door is opened and that is powered by low voltage, complete with transformer.

K. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel or powder coat.
 - b. Color: As selected by Architect from full range of industry colors and color densities.
2. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.3 FABRICATION

- A. Fire Protection Cabinets: Provide manufacturer's standard recessed box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 2. Fabricate door frames of one-piece construction with edges flanged.
 3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning". After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Fire Protection Cabinets: 54 inches above finished floor to top of cabinet.
- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
 1. Unless otherwise indicated, provide recessed fire protection cabinets.
 2. Provide inside latch and lock for solid panels.
 3. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.
- C. Identification: Apply lettering on cabinets at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 104416 - FIRE EXTINGUISHERS

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 portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.
- B. Related Sections:
 - 1. Section 104413 "Fire Extinguisher Cabinets."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by UL.
- C. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.7 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
 - 1. Basis of Design: Subject to compliance with requirements, provide Amerex Corporation B456 fire extinguishers or an Owner approved product by one of the following available manufacturers:
 - a. Guardian Fire Equipment, Inc.
 - b. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - c. Larsen's Manufacturing Company.
 - d. Pyro-Chem; Tyco Fire Suppression & Building Products.
 - e. Approved equal.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Valves: Nickel-plated, polished brass body.
3. Handles and Levers: Stainless steel.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

2.2 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized] steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.

1. Refer to Section 104413 "Fire Extinguisher Cabinets".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 104416

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 105115 – PLASTIC LAMINATE LOCKERS

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 Plastic laminate lockers and accessories.

- B. RELATED SECTIONS

- 1. Section 061053 “Miscellaneous Rough Carpentry” for blocking.

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 construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of Custom Plastic laminate lockers.

- B. Shop Drawings:

- 1. Include plans, elevations, sections, and attachment details.
- 2. Show locker trim and accessories.
- 3. Include locker identification system and numbering sequence.

- C. Samples: For each color specified, in 6 inch by 6 inch size.

- D. Product Schedule: For lockers. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. The following metal locker hardware items equal to no fewer than two units:

- a. Locks.
- b. Blank identification plates.
- c. Hooks.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.
- B. Deliver combination control charts to Owner by registered mail or overnight package service, addressed as follows:

Steve Rose
36 S. State Street Suite 2300
Salt lake City, Utah 84111

Notify Steve Rose by phone or email that the chart is being sent to his attention as it is sent to him (verify with him that the address.

Off: 801.422.2861
Cell: 801.850.1142
steve.rose@imail.org

1.9 FIELD CONDITIONS

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.10 QUALITY ASSURANCE

- A. All parts and hardware shall be AWI compliant, structurally sound and free from defects, in material and workmanship under normal use and service for the full warranty period.
- B. Protect locker finish and adjacent surfaces from damage.

1.11 WARRANTY

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain lockers and accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: For lockers indicated to be accessible (provide a minimum of 2), comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design", the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

2.3 PLASTIC LAMINATE LOCKERS

- A. Locker Frame: tops, sides and back shall be constructed of 3/4 inch high density thermos-fused melamine.
 - 1. Expansion/construction within +/- 1/16 inch per locker.
 - 2. Type of Lockers: Single tie, top shelf (ADA lockers to have all interior within reach range), coat rod and two side coat hooks.
 - 3. Visible Edges: sealed with a 1.5-millimeter PVC edge banding to closely match locker doors.
- B. Doors: One piece - Unperforated panel.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Laminate: 5/8 inch high-industrial grade particle board core with .03inch vertical grade high pressure class II-B fire retardant plastic laminate.
2. Matching laminate applied to interior and exterior door face.
3. Door edge sealed with a 1.5-millimeter PVC edge banding to closely match locker doors.
 - a. Number disk, 1.5 inch diameter flush mounted disc with 3/8 inch high contrast digits. US Flock 1L font.

C. Hardware/Accessories

1. Coat rod: 1-inch diameter stainless steel recessed rod.
2. Coat hooks(s): Heavy duty 2 prong stainless steel hooks – one each side.
3. Four (4) concealed, heavy duty European stainless steel hinges per door. 110-degree door opening with lifetime warranty
4. Locks: Digital punch-in type; Manufacturer – DIGILOCK (404.304.0086), Digilock STS series -Keypad, Surface mount, standard security latch. The lock is to be designed for shared use (shared by multiple people).
- 5.
- 6.

2.4 FABRICATION

- A. Locker shall be fabricated using doveled and glued and nailed assembly process.
- B.
- C. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.

2.5 FABRICATION

- A. Locker shall be fabricated using doveled and glued and nailed assembly process. Fabricate lockers square, rigid and without warp, with the finished faces flat and free of scratches and chips. Machine all parts and attachment holes accurately and without chips.
- B. Fabricate each locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
 1. Single-Tier Units: Shelf, two stainless steel double-prong wall hooks (one on each side).
 2. Coat Rods: Stainless steel, 1 inch diameter.
- D. Accessible Lockers: Fabricate as follows:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Locate bottom shelf no lower than 15 inches above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and floors, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install lockers level, plumb, and true; shim as required, using concealed shims.
 1. Anchor lockers to walls near top and bottom of lockers.
 2. Prior to installation, clean surfaces thoroughly.
 3. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the conditions.
 4. Install in accordance with manufacturer's instructions.
 5. Use concealed joint fasteners to align and secure adjoining cabinet units.
 6. Conceal screw heads with plastic caps to match locker interior.
 - 7.
- B. Equipment:
 1. Attach hooks with at least two fasteners.
 2. Attach door locks on doors using methods recommended by the lock manufacturer.
 3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - a. Attach plates to each locker door, near top, centered, with at least two fasteners.
- C. Trim: Install exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily , smoothly and correctly and without binding. Verify that integral locking devices operate properly.

3.4 PROTECTION

- A. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Replace lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.
- C. Clean locker interiors and exterior surfaces.

END OF SECTION 105113

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 113100 - APPLIANCES

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. Appliances.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, dimensions, furnished accessories, and finishes for each appliance.
- B. Sustainable Submittals:
 - 1. Product Data: For appliances indicated, documentation that products are ENERGY STAR rated.
 - 2. Product Data: For water-efficient clothes washer, documentation indicating modified energy factor and water factor.
- C. Product Schedule: For appliances. Use same designations indicated on Drawings and with-in this specification.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each type of appliance, from manufacturer.
- C. Field quality-control reports.
- D. Warranties: Sample warranties for each appliance.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each appliance to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain appliances from single source and each type of appliance from single manufacturer.
- C. Regulatory Requirements: Comply with the following:
 - 1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Accessibility: Comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines] [and] [ICC/ANSI A117.1.
- E. Preinstallation Conference: Conduct conference at Project site.

1.7 WARRANTY

- A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace appliances or components that fail in materials or workmanship within specified warranty period including as qualified below:
 - 1. Warranty Period: manufacturer's warranty – not less than 1 year.

PART 2 - PRODUCTS

2.1 COMPACT REFRIGERATOR – Under-counter

- A. Manufacturers: Basis-of-Design: General Electric, GE Compact Refrigerator, GME04GLKLB
- B. Refrigerator:
 - 1. Type: Under-counter.
 - 2. Appliance Color/Finish: Clean Steel.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.2 COMPACT BEVERAGE REFRIGERATOR – Glass Front, Under-counter

- A. Manufacturers: Basis-of-Design: General Electric, GE Monogram Stainless Steel Beverage Center, ZDBR240HBS
- B. Refrigerator:
 - 1. Type: Under-counter.
 - 2. Appliance Color/Finish: Clean Steel.

2.3 REFRIGERATOR/FREEZERS – full height.

- A. Manufacturers: Basis-of-Design: General Electric, Bottom-Freezer Drawer refrigerator, #GDE21EMKES.
- B. Refrigerator:
 - 1. Type: Full height.
 - 2. Appliance Color/Finish: Slate.

2.4 MICROWAVE OVENS

- A. MANUFACTURER Basis of Design: General Electric, Profile Series counter-top Convection/Microwave Oven, #PEB9159EJES
 - 1. COLOR: Slate.
 - 2. Oven Door: Door with observation window and pushbutton latch release.
 - 3. Microwave Power Rating: Manufacturer's standard.
 - 4. Electric Power Supply: 120 V, 60 Hz, 1 phase, 15 A.
 - 5. Controls: Digital panel controls and timer display.
 - 6. Stainless Steel
 - 7. Other Features: Turntable.

2.5 ICE MAKER

- A. Manufacturers: Basis-of-Design: Meridian, Ice machine/dispenser #HID540; Subject to compliance with requirements:
 - 1. Finish: Stainless Steel.

2.6 UNDER COUNTER ICE MAKER

- A. Manufacturers: Basis-of-Design: General Electric, Monogram Ice Maker 15-inch nugget ice #UNC15NJII.
 - 1. Finish: Stainless Steel.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.7 MINI CAFÉ BUNN COFFEE MAKER

A. Manufacturers: Basis-of-Design: xxx.

1. Appliance Color/Finish: xxx.

2.8 GENERAL FINISH REQUIREMENTS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Examine walls, ceilings, and roofs for suitable conditions where overhead exhaust hoods will be installed.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Utilities: Comply with plumbing and electrical requirements.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After installation, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

B. An appliance will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 113100

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 122113 - HORIZONTAL LOUVER BLINDS

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. Horizontal louver blinds with aluminum slats.
 - 2. Motorized operators.

- B. Related Requirements:

- 1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: For horizontal louver blinds, include fabrication and installation details.

- 1. Motorized Operators: Include details of installation in headrails and include diagrams for power, signal, and control wiring.

- C. Samples for Verification: For each type and color of horizontal louver blind indicated.

- 1. Slat: Not less than 12 inches long.
 - 2. Tapes: Full width, not less than 6 inches long.
 - 3. Horizontal Louver Blind: Full-size unit, not less than 16 inches wide by 24 inches long.
 - 4. Valance: Full-size unit, not less than 12 inches wide.

- D. Product Schedule: For horizontal louver blinds. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For horizontal louver blinds with polymer slats that have been tested for compliance with NFPA 701, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet-work and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where horizontal louver blinds 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 operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

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

1. Levolor Contract; a Newell Rubbermaid company; SKU# 00870

- B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.

1. Width: 1 inch.
2. Thickness: Manufacturer's standard.
3. Spacing: Manufacturer's standard.
4. Finish: Ionized antistatic, dust-repellent, baked polyester finish.
5. Features:

- a. Lift-Cord Rout Holes: Minimum size required for lift cord and located near back (outside) edge of slat to maximize slat overlap and minimize light gaps between slats.
- b. Perforated Slats: Openness factor of 6 to 7 percent.

- C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose operating mechanisms on three sides.

1. Capacity: One blind per headrail unless otherwise indicated.
2. Ends: Manufacturer's standard unless existing is different, then match existing.
3. Manual Lift Mechanism:
 - a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within blind full operating range.
 - b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.
4. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
 - a. Tilt: Full.
 - b. Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over rotation of gear.
5. Manual Lift-Operator and Tilt-Operator Lengths: Manufacturer's standard unless existing is different, then match existing.

6. Manual Lift-Operator and Tilt-Operator Locations: Manufacturer's standard unless existing is different, then match existing Retain "Integrated Headrail/Valance" Subparagraph below if separate valance is not required; verify availability for products selected.
 7. Integrated Headrail/Valance: match existing.
- D. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.
1. Type: Manufacturer's standard.
- E. Lift Cords: Manufacturer's standard braided cord.
- F. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.
1. Type: Braided cord.
- G. Valance: Manufacturer's standard unless existing is different, then match existing.
- H. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
1. Type: Match existing.
 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.
- I. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.
- J. Side Channels and Perimeter Light Gap Seals: Manufacturer's standard.
- K. Colors, Textures, Patterns, and Gloss:
1. Slats: Match existing
 2. Components: Match existing.

2.3 HORIZONTAL LOUVER BLIND FABRICATION

- A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch. Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.

2. Outside of Jamb Installation: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.
- D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- F. Color-Coated Finish:
1. Metal: For 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.

2.4 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

2.5 INSTALLATION

- A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
 1. Locate so exterior slat edges are not closer than 1 inch, unless existing is different, then match existing, from interior faces of glass and not closer than 1/2 inch, unless existing is different, then match existing, from interior faces of glazing frames through full operating ranges of blinds.
 2. Install mounting and intermediate brackets to prevent deflection of headrails.
 3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.6 ADJUSTING

- A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

2.7 CLEANING AND PROTECTION

- A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

2.8 DEMONSTRATION

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

END OF SECTION 122113

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 122413 - ROLLER WINDOW SHADES

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. Motor-operated roller shades with double rollers.

- B. Related Requirements:

- 1. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades and manufacturers recommendations for maintenance and cleaning.

- B. Shop Drawings: Show fabrication and installation details for roller shades, including materials, their orientation to rollers, and their seam and batten locations.

- C. Samples for Verification: For each type of roller shade.

- 1. Material: Not less than 10 inches square. Mark inside face of material if applicable.
 - 2. Roller Shade: Full-size operating unit
 - 3. Installation Accessories: Full-size unit

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roller shades to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Roller Shades: Two Full-size units for each size, color, and material indicated.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of Product. Installer to have installed specified product prior on a minimum of 5 projects.
- B. Mockups: Provide one (1) mock-up for shade specified.
- C. Provide shades from only one manufacturer for the project.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.
- B. Store Product so that it does not get damaged.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry 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 operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.10 WARRANTY

- A. Provide a Lifetime Limited Warranty on the complete shade, unless noted otherwise.
- B. Provide 5 year warranty on the Fabric.

- C. Warranties are to be from the manufacturer of the shades.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements,
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Hunter Douglas Contract - "RB500 Roller Shades"
- C. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MOTOR-OPERATED, DOUBLE-ROLLER SHADES

- A. Motorized Operating Systems: Provide factory-assembled, shade-operator systems of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and 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 building electrical system.
 - 1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Electric Motor: Manufacturer's standard tubular, enclosed in rollers.
 - a. Electrical Characteristics: 110-V ac.
 - b. Maximum Total Shade Width: As required to operate roller shades indicated.
 - c. Maximum Shade Drop: to sill, field verify.
 - d. Maximum Weight Capacity: As required to operate roller shades indicated.
 - 3. Remote Control: Electric controls to be tied into the audio visual system, coordinate with other trades. Provide the following for remote-control activation of shades:
 - a. Group Control Station: Maintained open, close, and center off functions and pre-set functions for single-switch group control.
 - b. Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features; isolated from voltage spikes and surges.
 - c. Color: [As selected by Architect from manufacturer's full range] <Insert color>.
 - d. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
 - e. Capable of interface with audiovisual control system.

- f. Override switch.

- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shades for service.
 - 1. Double-Roller Mounting Configuration: Offset, outside shade over and inside shade under.
 - 2. Inside Roller:
 - a. Drive-End Location: Right side of interior face of shade.
 - 3. Outside Roller:
 - a. Drive-End Location: Right side of interior face of shade.
 - b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
 - 4. Shadeband-to-Roller Attachment: Manufacturer's standard method.

- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

- E. Mounting: Jamb to Jamb.

- F. Inside Shadebands (room side):
 - 1. Shadeband Material: Light-filtering fabric.
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Exposed with fascia.
 - b. Color and Finish: 5% light filtering, See finish schedule / legend.

- G. Outside Shadebands (window side):
 - 1. Shadeband Material: black-out.
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Exposed with fascia.
 - b. Color and Finish: Black-out shade; See finish schedule / legend.

- H. Installation Accessories:
 - 1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Shape: L-shaped.
 - b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches.
2. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
 3. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
 4. Installation Accessories Color and Finish: match as indicated..

2.3 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabrics: Woven fabric, stain and fade resistant, verify with Architect.
 1. Source: NYSAN, verify with Architect.
 2. Shadeband Material: Light-filtering fabric, opacity 5% open, as indicated on Drawings.
 3. Roll Width: As indicated on drawings; Field Verify.

2.4 ROLLER-SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg:
 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, including jamb guides for the black-out shade.

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. Clean finish installation of dirt and finger marks and anything else that makes the shade unclean. Leave work area clean and free of debris that was created by the installation of the shade.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that 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 roller shades.

END OF SECTION 122413

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 123661 – SOLID SURFACE COUNTERTOPS

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. Solid-surface-material countertops and backsplashes.
- B. Related Sections:
 - 1. 064116 "Plastic Laminate Faced Architectural Cabinets.
 - 2. 123662 "Quartz Agglomerate Countertops.

1.3 ACTION SUBMITTALS

- A. Product Data: For countertop materials and sinks.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
- C. Samples for Initial Selection: For each type of material exposed to view.
- D. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches square.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements.

1.5 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE-MATERIAL COUNTERTOPS

- A. Configuration: Provide countertops with the following front and backsplash style, unless otherwise indicated:
 - 1. Front: Straight, slightly eased at top.
 - 2. Backsplash: Straight, slightly eased at corner.
 - 3. Endsplash: Matching backsplash.
- B. Countertops: 3/4-inch- thick, solid surface material with front edge built up with same material.
- C. Backsplashes: 3/4-inch- thick, solid surface material.
- D. Fabrication: Fabricate tops in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate with loose backsplashes for field assembly.
 - 2. Install integral sink bowls in countertops in the shop.

2.2 COUNTERTOP MATERIALS

- A. Plywood: Exterior marine grade softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
- B. Adhesives: Adhesives shall not contain urea formaldehyde.
- C. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
 - 1. Manufacturers: Subject to compliance with requirements:
 - a. Coordinate with Construction Documents, see Finish legend.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

1. Install backsplashes and endsplashes to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
2. Seal edges of cutouts in particleboard subtops by saturating with varnish.

END OF SECTION 123661

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 123662 - QUARTZ AGGLOMERATE COUNTERTOPS AND WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Quartz agglomerate countertops and Walls.
- B. Related Sections:
 - 1. 064116 "Plastic Laminate Faced Architectural Cabinets.
 - 2. 123661 "Solid Surface Countertops.

1.3 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- C. Samples for Initial Selection: For each type of material exposed to view.
- D. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For quartz agglomerate countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

- A. Quartz Agglomerate: 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. Coordinate with the construction documents, see finish legend.
 - 2. Colors and Patterns: As indicated on finish legend.
- B. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.

or
- C. Plywood: Exterior marine grade softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Grade: Custom.
- B. Configuration:
 1. Front: As detail on construction documents.
 2. Backsplash: As detail on construction documents.
 3. End Splash: Matching backsplash and as detail on construction documents.
- C. Countertops: 3/4-inch- thick, quartz agglomerate with front edge built up with same material.
- D. Backsplashes: 3/4-inch- thick, quartz agglomerate, where occurs.
- E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 1. Fabricate with loose backsplashes for field assembly.
- F. Joints: Fabricate countertops without joints.
- G. Cutouts and Holes:
 1. Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
 - b. Provide vertical edges, rounded to 3/8-inch radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch into fixture opening.
 - c. Provide 3/4-inch full bullnose edges projecting 3/8 inch into fixture opening.
 2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by quartz agglomerate manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- F. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Pre-drill holes for screws as recommended by manufacturer.
- G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
 - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- H. Install wall paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.

1. Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening unless covered by trim.
- I. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123662

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

THIS PAGE IS INTENTIONALLY LEFT BLANK

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipes, fittings, and specialties.
 - 2. Specialty valves.
 - 3. Sprinklers.
 - 4. Alarm devices.
 - 5. Pressure gages.

1.3 DEFINITIONS

- A. 175 psig Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.
- B. AHJ: Authority Having Jurisdiction.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 2. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each fire-department connection.
- B. Shop Drawings: For wet-pipe sprinkler systems.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include diagrams for power, signal, and control wiring.
- C. Delegated-Design Submittal: For wet-pipe sprinkler 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.

INTERMOUNTAIN WTC 19

INTERMOUNTAIN KBT 22

36 S. State Street

Salt Lake City, Utah

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Domestic water piping.
 - 2. Compressed air piping.
 - 3. HVAC hydronic piping.
 - 4. Items penetrating finished ceiling include the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
- B. Qualification Data: For qualified Installer.
- C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- D. Welding certificates.
- E. Fire-hydrant flow test report.
- F. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- G. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
- B. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.

1.9 FIELD CONDITIONS

- A. Interruption of Existing Work Functions: Do not interrupt work functions in the existing building unless notification and acceptance by Owner has been received:
 1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of work functions.
 2. Do not proceed with interruption without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Project scope:
 1. Existing construction: modify existing wet pipe fire suppression system with new concealed sprinkler heads on flexible drops.
 2. Sprinkler heads should be centered on one half of all 2x4 acoustical tiles and centered on all 2x2 acoustical tiles in all areas.
 3. Coordination with other trades is important. Sprinkler locations, types, and colors not complying with above and not approved by the architect in writing and installed shall be removed and surfaces repaired at no cost by the fire sprinkler contractor.
- B. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 1. NFPA 13, 2010 Edition unless otherwise directed by AHJ.
 2. Local codes or ordinances.
- C. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- D. Delegated Design: Engage a qualified professional engineer or NICET Level III technician to design wet-pipe sprinkler systems.
 1. Perform a water flow test near the site and publish results to architect and EOR for review. Information that should be included in the published results includes, but is not limited to, the following:
 - a. Date.
 - b. Time.
 - c. Performed by, name and firm.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- d. Water utility and name of contact/witness.
 - e. Location of Residual Fire Hydrant R.
 - f. Location of Flow Fire Hydrant F.
 - g. Static Pressure at Residual Fire Hydrant R **psig**.
 - h. Measured Flow at Flow Fire Hydrant F **gpm**.
 - i. Residual Pressure at Residual Fire Hydrant R **psig**.
2. Sprinkler system design shall be approved by authorities having jurisdiction.
- a. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
 - b. Sprinkler Occupancy Hazard Classifications:
 - 1) Building Service Areas: Ordinary Hazard, Group 1.
 - 2) Electrical Equipment Rooms: Ordinary Hazard, Group 1.
 - 3) General Storage Areas: Ordinary Hazard, Group 1.
 - 4) Laundries: Ordinary Hazard, Group 1.
 - 5) Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
 - 6) Office and Public Areas: Light Hazard.
 - 7) Other areas not meeting the space classifications above shall be brought to the attention of the architect for review and classification.
3. Minimum Density for Automatic-Sprinkler Piping Design:
- a. 0.05 gpm over 400-sq. ft. Light-Hazard Occupancy; 0.10 gpm over 1500-sq. ft. area.
 - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
 - c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
 - d. Extra-Hazard, Group 1 Occupancy: 0.30 gpm over 2500-sq. ft. area.
 - e. Extra-Hazard, Group 2 Occupancy: 0.40 gpm over 2500-sq. ft. area.
 - f. Special Occupancy Hazard: As determined by authorities having jurisdiction.
4. Maximum Protection Area per Sprinkler: According to UL listing.
- E. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

2.2 STEEL PIPE AND FITTINGS

- A. Schedule 40, Black-Steel Pipe: ASTM A 135/A 135M; ASTM A 795/A 795M, Type E; Pipe ends may be factory or field formed to match joining method.
- B. Galvanized- and Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- C. Galvanized- and Uncoated-Steel Couplings: ASTM A 865/A 865M, threaded.
- D. Galvanized and Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- E. Malleable- or Ductile-Iron Unions: UL 860.
- F. Cast-Iron Flanges: ASME 16.1, Class 125.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- G. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
 - 1. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick ASME B16.21, nonmetallic and asbestos free or EPDM rubber gasket.
 - a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
 - b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.
 - 2. Metal, Pipe-Flange Bolts and Nuts: Carbon steel unless otherwise indicated.
- H. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.
 - 1. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- I. Grooved-Joint, Steel-Pipe Appurtenances:
 - 1. Pressure Rating: 175-psig minimum.
 - 2. Uncoated Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
 - 3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 SPECIALTY VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating:
 - 1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.
- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. Automatic (Ball Drip) Drain Valves:
 - 1. Standard: UL 1726.
 - 2. Pressure Rating: 175-psig minimum.
 - 3. Type: Automatic draining, ball check.
 - 4. Size: NPS 3/4.
 - 5. End Connections: Threaded.

2.4 SPRINKLER PIPING SPECIALTIES

- A. Branch Outlet Fittings:
 - 1. Standard: UL 213.
 - 2. Pressure Rating: 175-psig minimum

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
 4. Type: Mechanical-tee and -cross fittings.
 5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
 6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
 7. Branch Outlets: Grooved, plain-end pipe, or threaded.
- B. Flow Detection and Test Assemblies:
1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 2. Pressure Rating: 175-psig minimum
 3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
 4. Size: Same as connected piping.
 5. Inlet and Outlet: Threaded or grooved.
- C. Sprinkler Inspector's Test Fittings:
1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 2. Pressure Rating: 175-psig minimum
 3. Body Material: Cast- or ductile-iron housing with sight glass.
 4. Size: Same as connected piping.
 5. Inlet and Outlet: Threaded.
- D. Flexible Sprinkler Hose Fittings:
1. Standard: UL 1474.
 2. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
 3. Pressure Rating: 175-psig minimum **300 psig**.
 4. Size: Same as connected piping, for sprinkler.

2.5 SPRINKLERS

- A. Acceptable Manufacturers:
1. [Reliable Automatic Sprinkler Co.](#)
 2. [Tyco Fire & Building Products LP.](#)
 3. [Victaulic Company.](#)
 4. [Viking Corporation.](#)
- B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- C. Pressure Rating for Residential Sprinklers: 175-psig maximum.
- D. Pressure Rating for Automatic Sprinklers: 175-psig minimum.
- E. Pressure Rating for High-Pressure Automatic Sprinklers: 250-psig minimum
- F. Automatic Sprinklers with Heat-Responsive Element:
1. Nonresidential Applications: UL 199.
 2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- G. Sprinkler Finishes: as directed by architect.

- H. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
 - 1. Ceiling Mounting: one piece, with minimum 0.51-inch vertical adjustment.
 - 2. Sidewall Mounting: one piece, with minimum 0.5-inch vertical adjustment.

- I. Sprinkler Guards:
 - 1. Standard: UL 199.
 - 2. Type: Wire cage with fastening device for attaching to sprinkler.

2.6 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.

- B. Operated Alarm Bell:
 - 1. Standard: UL 464.
 - 2. Type: Vibrating, metal alarm bell.
 - 3. Size: 6-inch minimum diameter.
 - 4. Finish: Red-enamel factory finish, suitable for outdoor use.
 - 5. 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

- C. Sprinkler Alarm Horn Strobe and Sign Combination
 - 1. The device shall consist of a weatherproof 24 V strobe horn, weatherproof backbox and red non corrosive sign with white lettering identifying it as a sprinkler alarm with instructions to contact the fire department or 911. The strobe horn shall be cULus Listed. Sprinkler Alarm Strobe Horn shall be model SASH12/24.

- D. Water-Flow Indicators:
 - 1. Standard: UL 346.
 - 2. Water-Flow Detector: Electrically supervised.
 - 3. Components: 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.
 - 4. Type: Paddle operated.
 - 5. Pressure Rating: 250 psig.
 - 6. Design Installation: Horizontal or vertical.

- E. Valve Supervisory Switches:
 - 1. Standard: UL 346.
 - 2. Type: Electrically supervised.
 - 3. Components: Single-pole, double-throw switch with normally closed contacts.
 - 4. Design: Signals that controlled valve is in other than fully open position.
 - 5. 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
2.7 NPS 1/2NPS 1/2PRESSURE GAGES

- A. Standard: UL 393.
- B. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- C. Pressure Gage Range: 0- to 250-psig minimum.
- D. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

3.2 SERVICE-ENTRANCE PIPING

- A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements for exterior piping in Section 211100 "Facility Fire-Suppression Water-Service Piping" for exterior piping.
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping.

3.3 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.
 - 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.
 - 2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.
- C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.
- D. Use listed 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- H. Install sprinkler piping with drains for complete system drainage.
- I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- K. Install alarm devices in piping systems.
- L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13. In seismic-rated areas, refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."
- M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.
- N. Fill sprinkler system piping with water.
- O. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.4 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

- H. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

- I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

- J. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

- K. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

- L. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.5 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

- D. Specialty Valves:
 - 1. Install valves in vertical position for proper direction of flow, in main supply to system.
 - 2. Install alarm valves with bypass check valve and retarding chamber drain-line connection.
 - 3. Install deluge valves in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
3.6 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.
- B. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.7 FIRE DEPARTMENT CONNECTION EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fire-department connections.
- B. Examine roughing-in for fire-suppression standpipe system to verify actual locations of piping connections before fire-department connection installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.8 FIRE DEPARTMENT CONNECTION INSTALLATION

- A. Install wall-type fire-department connections.
- B. Install automatic (ball-drip) drain valve at each check valve for fire-department connection.

3.9 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.10 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Coordinate with fire-alarm tests. Operate as required.
 - 6. Verify that equipment hose threads are same as local fire department equipment.
- B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Prepare test and inspection reports.

3.11 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.12 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain the system.

END OF SECTION 211313

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Sleeve-seal systems.
 - 3. Grout.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 - 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade: Galvanized-steel-pipe sleeves.
 - 2. Exterior Concrete Walls below Grade:
 - a. Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs-on-Grade:
 - a. Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 4. Concrete Slabs above Grade:
 - a. PVC-pipe sleeves.
 - 5. Interior Partitions:
 - a. Piping Smaller Than NPS 6: PVC-pipe sleeves.
 - b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 220517

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
 - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
 - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
- 1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

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. Bronze ball valves.
- B. Related Sections:
 - 1. Section 221116 "Domestic Water Piping" for valves applicable only to this piping.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. SWP: Steam working pressure.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set angle, gate, and globe valves closed to prevent rattling.
 - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 5. Set butterfly valves closed or slightly open.
 - 6. Block check valves in either closed or open position.

- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.

- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

- C. Valve Sizes: Same as upstream piping unless otherwise indicated.

- D. Valve Actuator Types:
 - 1. Handlever: For quarter-turn valves NPS 6 and smaller.

- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
 - 1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 2. Butterfly Valves: With extended neck.

- F. Valve-End Connections:
 - 1. Solder Joint: With sockets according to ASME B16.18.
 - 2. Threaded: With threads according to ASME B1.20.1.

- G. Valve Bypass and Drain Connections: MSS SP-45.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.2 BRONZE BALL VALVES

- A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. NIBCO INC.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Bronze.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball valves.
 - 2. Throttling Service: Ball valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Ball Valves: Two piece, full port, bronze with bronze trim.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Thermal-hanger shield inserts.
 - 4. Fastener systems.
 - 5. Pipe positioning systems.
 - 6. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:
 - 1. Trapeze pipe hangers.
 - 2. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers 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 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Stainless-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
- C. Copper Pipe Hangers:
 - 1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
 - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- M. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
 - 5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
 - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and 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. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 - 6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 - 9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
- P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

- R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Equipment labels.
 2. Warning signs and labels.
 3. Pipe labels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
1. Material and Thickness: aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 2. Letter Color: Black.
 3. Background Color: White.
 4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 6. Fasteners: Stainless-steel rivets or self-tapping screws.
 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
 2. Letter Color: Black.
 3. Background Color: White.
 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: White.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information plus emergency notification instructions.
- J. Pipe Label Color Schedule:
 1. Low-Pressure Compressed Air Piping:
 - a. Background: Safety blue.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- b. Letter Colors: White.
- 2. High-Pressure Compressed Air Piping:
 - a. Background: Safety blue.
 - b. Letter Colors: White.
- 3. Domestic Water Piping
 - a. Background: Safety green.
 - b. Letter Colors: White.
- 4. Sanitary Waste and Storm Drainage Piping:
 - a. Background Color: Safety black.
 - b. Letter Color: White.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic hot-water piping.
 - 2. Domestic recirculating hot-water piping.
 - 3. Sanitary waste piping exposed to freezing conditions.
 - 4. Storm-water piping exposed to freezing conditions.
 - 5. Roof drains and rainwater leaders.
 - 6. Supplies and drains for handicap-accessible lavatories and sinks.

- B. Related Sections:
 - 1. Section 220716 "Plumbing Equipment Insulation."

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content and chemical components.
 - 2. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that product complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail attachment and covering of heat tracing inside insulation.
 - 3. Detail insulation application at pipe expansion joints for each type of insulation.
 - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 5. Detail removable insulation at piping specialties, equipment connections, and access panels.
 - 6. Detail application of field-applied jackets.
 - 7. Detail application at linkages of control devices.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Special-Shaped Insulation: ASTM C 552, Type III.
 - 2. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. Preformed Pipe Insulation with Factory-Applied: Comply with ASTM C 552, Type II, Class 2.
 4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
- H. Mineral-Fiber, Preformed Pipe Insulation:
1. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, without factory-applied jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- I. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.
1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. PVC Jacket Adhesive: Compatible with PVC jacket.
1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 4. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 3. Solids Content: 60 percent by volume and 66 percent by weight.
 4. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 1. Adhesive: As recommended by jacket material manufacturer.
 2. Color: White Color-code jackets based on university system. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- C. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Same material, finish, and thickness as jacket.
 - b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - c. Tee covers.
 - d. Flange and union covers.
 - e. End caps.
 - f. Beveled collars.
 - g. Valve covers.
 - h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- D. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 1. Width: 3 inches.
 2. Thickness: 11.5 mils.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Width: 3 inches.
 2. Thickness: 6.5 mils.
 3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Width: 2 inches.
 2. Thickness: 6 mils.
 3. Adhesion: 64 ounces force/inch in width.
 4. Elongation: 500 percent.
 5. Tensile Strength: 18 lbf/inch in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Width: 2 inches.
 2. Thickness: 3.7 mils.
 3. Adhesion: 100 ounces force/inch in width.
 4. Elongation: 5 percent.
 5. Tensile Strength: 34 lbf/inch in width.

2.10 SECUREMENTS

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- C. Wire: 0.080-inch nickel-copper alloy.

2.11 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers,:
 1. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.
- B. Protective Shielding Piping Enclosures,:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 1. Install insulation continuously through hangers and around anchor attachments.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Cleanouts.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.

- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 - 4. Seal jacket to wall flashing with flashing sealant.

- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

- F. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Hot and Recirculated Hot Water piping up to 1-1/4": Insulation shall be one of the following:
 - 1. Flexible Elastomeric: 1-1/2inch thick.
 - 2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 - 3. Polyolefin: 1-1/2inch thick.

- B. Domestic Hot and Recirculated Hot Water piping greater than 1-1/4": Insulation shall be one of the following:
 - 1. Flexible Elastomeric: 2inch thick.
 - 2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
 - 3. Polyolefin: 2inch thick.

- C. Domestic Cold Water piping up to 1-1/4": Insulation shall be one of the following:
 - 1. Flexible Elastomeric: 3/4inch thick.
 - 2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
 - 3. Polyolefin: 3/4inch thick.

- D. Domestic Cold Water piping greater than 1-1/4": Insulation shall be one of the following:
 - 1. Flexible Elastomeric: 1-1/2inch thick.
 - 2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 - 3. Polyolefin: 1-1/2inch thick.

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

- B. If more than one material is listed, selection from materials listed is Contractor's option.

- C. Piping, Concealed:
 - 1. White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

- D. Piping, Exposed:
 - 1. PVC, Color-Coded by System: 20 mils thick.

3.15 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

- A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3.16 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified by architect.

- B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING

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. Aboveground domestic water pipes, tubes, and fittings inside buildings.

1.3 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

1.5 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
 - 2. Do not interrupt water service without Owner's written permission.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
 - 1. Store PEX tubing in cartons or under cover to avoid dirt or foreign material from entering the tubing.
 - 2. Do not expose PEX tubing to direct sunlight for more than 30 days. If construction delays are encountered, cover the tubing to prevent exposure to direct sunlight

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- D. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.
- E. Copper Pressure-Seal-Joint Fittings:
 - 1. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
 - 2. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
- F. Copper Push-on-Joint Fittings:
 - 1. Description:
 - a. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
 - b. Stainless-steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.

2.3 CPVC PIPING

- A. CPVC Pipe: ASTM F 441/F 441M, Schedule 40.
 - 1. CPVC Socket Fittings: ASTM F 438 for Schedule 40.
 - 2. CPVC Threaded Fittings: ASTM F 437, Schedule 80.
- B. CPVC Piping System: ASTM D 2846/D 2846M, SDR 11, pipe and socket fittings.
- C. CPVC Tubing System: ASTM D 2846/D 2846M, SDR 11, tube and socket fittings.

2.4 PEX TUBE AND FITTINGS

- A. PEX Distribution System: ASTM F 877, SDR 9 tubing. Fittings in "Fittings for PEX Tube" Paragraph below are available in NPS 3/8 to NPS 1 (DN 10 to DN 25).
- B. PEX Fittings: elbows, adapters, couplings, plugs, tees and multi-port tees (1/2 inch through 3 inch nominal pipe size): ASTM F1960 cold-expansion fitting manufactured from the following material types:
 - 1. UNS No. C69300 Lead-free (LF) Brass.
 - 2. 20% glass-filled polysulfone as specified in ASTM D 6394.
 - 3. Unreinforced polysulfone (group 01, class 1, grade 2) as specified in ASTM D 6394.
 - 4. Polyphenylsulfone (group 03, class 1, grade 2) as specified in ASTM D 6394.
 - 5. Blend of polyphenylsulfone (55-80%) and unreinforced polysulfone (rem.) as specified in ASTM D 6394.
 - 6. Reinforcing cold-expansion rings shall be manufactured from the same source as PEX piping manufacturer and marked "F1960".
- C. Pre-Insulated Piping (1/2 inch (16mm) through 2 inch (50mm) nominal pipe size): PEX piping, with a closed-cell polyethylene foam insulation.
- D. Multi-Port Tees: Multiple-outlet fitting complying with ASTM F 877 (CAN/CSA B137.5); with ASTM F 1960 inlets and outlets.
 - 1. Engineered polymer branch multi-port tee.
 - 2. Engineered polymer flow-through multi-port tee.
 - 3. Engineered polymer commercial branch multi-port tee.
 - 4. Engineered polymer commercial branch multi-port elbow.
 - 5. Engineered polymer commercial flow-through multi-port tee.
- E. Manifolds: Multiple-outlet assembly complying with ASTM F 877 (CAN/CSA B137.5); with ASTM F 1960 outlets.
 - 1. Engineered polymer valved manifold.
 - 2. Engineered polymer valveless manifold.
 - 3. Lead - free copper branch manifold.
 - 4. Lead-free copper valved manifold.
- F. PEX-to-Metal Transition Fittings:
 - 1. Manufacturers: Provide fittings from the same manufacturer of the piping.
 - 2. Threaded Brass to PEX Transition: one-piece brass fitting with male or female threaded adapter and ASTM F 1960 cold-expansion end, with PEX reinforcing cold-expansion ring.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. Brass Sweat to PEX Transition: one-piece brass fitting with sweat adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
 4. PEX to Flange Transition: two-piece brass fitting with lead-free ProPEX adapter and steel flange conforming to ASME B 16.5.
- G. PEX-to-Thermoplastic Transition Fittings: CPVC to PEX Transition: Thermoplastic fitting with one spigot or socket end and one ASTM F 1960 cold-expansion end, with PEX reinforcing cold-expansion ring.
- H. VALVES
1. PEX-to-PEX, Lead Free (LF) Brass Ball Valves (1/2 inch (16 mm) through 2 inch (50 mm) nominal pipe size)
 - a. Manufacturers: Provide ball valve(s) from the same manufacturer as the piping system.
 - b. Full-port ball valve: two-piece, ASTM F1960 cold-expansion ends, with PEX reinforcing cold-expansion ring.
 - c. LF brass valve with a positive stop shoulder manufactured from C69300 brass.
 - d. In compliance with: 250 CWP, ANSI/NSF 359, ANSI/NSF 14/61, cNSF-us-pw_G lead free 0.25% Lead max., ASTM F1960, ASTM F 877 (CAN/CSA B137.5).

2.5 PVC PIPE AND FITTINGS

- A. PVC Pipe: ASTM D 1785, Schedule 40.
- B. PVC Socket Fittings: ASTM D 2466 for Schedule 40.
- C. PVC Schedule 80 Threaded Fittings: ASTM D 2464.

2.6 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.'

2.7 TRANSITION FITTINGS

- A. General Requirements:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Same size as pipes to be joined.
 2. Pressure rating at least equal to pipes to be joined.
 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Cascade Waterworks Manufacturing.](#)
 - b. [Dresser, Inc.; Piping Specialties Products.](#)
 - c. [Ford Meter Box Company, Inc. \(The\).](#)
 - d. [JCM Industries.](#)
 - e. [Romac Industries, Inc.](#)
 - f. [Smith-Blair, Inc.; a Sensus company.](#)
 - g. [Viking Johnson.](#)

2.8 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Capitol Manufacturing Company; member of the Phoenix Forge Group.](#)
 - b. [Central Plastics Company.](#)
 - c. [Hart Industries International, Inc.](#)
 - d. [Jomar International.](#)
 - e. [Matco-Norca.](#)
 - f. [McDonald, A. Y. Mfg. Co.](#)
 - g. [Watts; a division of Watts Water Technologies, Inc.](#)
 - h. [Wilkins; a Zurn company.](#)
 2. Standard: ASSE 1079.
 3. Pressure Rating: 250 psig at 180 deg F.
 4. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. 175 psig minimum 150 psig Dielectric Nipples:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Elster Perfection Corporation.](#)
 - b. [Grinnell Mechanical Products; Tyco Fire Products LP.](#)

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- c. [Matco-Norca](#).
 - d. [Precision Plumbing Products, Inc.](#)
 - e. [Victaulic Company](#).
- 2. Standard: IAPMO PS 66.
 - 3. Electroplated steel nipple complying with ASTM F 1545.
 - 4. Pressure Rating and Temperature: 300 psig at 225 deg F.
 - 5. End Connections: Male threaded or grooved.
 - 6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install shutoff valve immediately upstream of each dielectric fitting.
- C. Install domestic water piping level without pitch and plumb.
- D. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- H. Install piping to permit valve servicing.
- I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- J. Install piping free of sags and bends.
- K. Install fittings for changes in direction and branch connections.
- L. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- M. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 230519 "Meters and Gages for Hydronic Piping."
- N. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."
- O. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 230519 "Meters and Gages for Hydronic Piping."

3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- F. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. NPS 1-1/2/NPS 2 Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.4 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

3.5 NPS 2-1/2 to NPS 4 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - 3. 100 Feet100 Feet100 FeetBase of Vertical Piping: MSS Type 52, spring hangers.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
- F. NPS 2-1/2108 inches1/2-inchNPS 3 to NPS 510 feet1/2-inchInstall supports for vertical copper tubing every 10 feet.
- G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.7 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 230553 "Identification for Mechanical Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
 - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 - 2. Piping Tests:
 - a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
 - f. Prepare reports for tests and for corrective action required.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.9 ADJUSTING

- A. Perform the following adjustments before operation:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.
 - 3. Open throttling valves to proper setting.
 - 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
 - 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
 - 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 - 7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
 - 8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
 - 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Clean non-potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:
 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.

3.12 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
 2. NPS 2 NPS 2-1/2 Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
 3. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.
- C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION 221116

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

BLANK PAGE

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

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. Vacuum breakers.
 - 2. Backflow preventers.
 - 3. Water pressure-reducing valves.
 - 4. Balancing valves.
 - 5. Temperature-actuated, water mixing valves.
 - 6. Strainers.
 - 7. Outlet boxes.
 - 8. Hose stations.
 - 9. Hose bibbs.
 - 10. Wall hydrants.
 - 11. Ground hydrants.
 - 12. Post hydrants.
 - 13. Drain valves.
 - 14. Water-hammer arresters.
 - 15. Air vents.
 - 16. Trap-seal primer valves.
 - 17. Trap-seal primer systems.
 - 18. Specialty valves.
 - 19. Flexible connectors.
 - 20. Water meters.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For domestic water piping specialties.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
 - 1. Standard: ASSE 1001.
 - 2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
 - 3. Body: Bronze.
 - 4. Inlet and Outlet Connections: Threaded.
- B. Hose-Connection Vacuum Breakers:
 - 1. Standard: ASSE 1011.
 - 2. Body: Bronze, nonremovable, with manual drain.
 - 3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
- C. Pressure Vacuum Breakers :
 - 1. Standard: ASSE 1020.
 - 2. Operation: Continuous-pressure applications.
 - 3. Pressure Loss: 5 psig maximum, through middle third of flow range.
 - 4. Accessories:
 - a. Valves: Ball type, on inlet and outlet.
- D. Laboratory-Faucet Vacuum Breakers:
 - 1. Standard: ASSE 1035.
 - 2. Size: NPS 1/4 or NPS 3/8 matching faucet size.
 - 3. Body: Bronze.
 - 4. End Connections: Threaded.
 - 5. Finish: Chrome plated.
- E. Spill-Resistant Vacuum Breakers :

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Standard: ASSE 1056.
2. Operation: Continuous-pressure applications.
3. Accessories:
 - a. Valves: Ball type, on inlet and outlet.

2.4 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:

1. Standard: ASSE 1012.
2. Operation: Continuous-pressure applications.
3. Body: Bronze.

B. Reduced-Pressure-Principle Backflow Preventers:

1. Standard: ASSE 1013.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 12 psig maximum, through middle third of flow range.
4. Body: Bronze for NPS 2 and smaller; stainless steel for NPS 2-1/2 and larger.
5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
6. Configuration: Designed for horizontal, straight-through flow.
7. Accessories:
 - a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
 - c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

C. Double-Check, Backflow-Prevention Assemblies:

1. Standard: ASSE 1015.
2. Operation: Continuous-pressure applications unless otherwise indicated.
3. Pressure Loss: 5 psig maximum, through middle third of flow range.
4. Body: Bronze for NPS 2 and smaller; stainless steel for NPS 2-1/2 and larger.
5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
6. Configuration: Designed for horizontal, straight-through flow.
7. Accessories:
 - a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

D. Beverage-Dispensing-Equipment Backflow Preventers:

1. Standard: ASSE 1022.
2. Operation: Continuous-pressure applications.
3. Size: NPS 1/4 or NPS 3/8.
4. Body: Stainless steel.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

5. End Connections: Threaded.
- E. Dual-Check-Valve Backflow Preventers:
1. Standard: ASSE 1024.
 2. Operation: Continuous-pressure applications.
 3. Body: Bronze with union inlet.
- F. Carbonated-Beverage-Dispenser, Dual-Check-Valve Backflow Preventers:
1. Standard: ASSE 1032.
 2. Operation: Continuous-pressure applications.
 3. Size: NPS 1/4 or NPS 3/8.
 4. Body: Stainless steel.
 5. End Connections: Threaded.
- G. Reduced-Pressure-Detector, Fire-Protection, Backflow-Preventer Assemblies:
1. Standard: ASSE 1047 and is FM Global approved or UL listed.
 2. Operation: Continuous-pressure applications.
 3. Pressure Loss: 12 psig maximum, through middle third of flow range.
 4. Body: Stainless steel.
 5. End Connections: Flanged.
 6. Configuration: Designed for horizontal, straight-through flow.
 7. Accessories:
 - a. Valves: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
 - c. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.
- H. Double-Check, Detector-Assembly Backflow Preventers:
1. Standard: ASSE 1048 and is FM Global approved or UL listed.
 2. Operation: Continuous-pressure applications.
 3. Pressure Loss: 5 psig maximum, through middle third of flow range.
 4. Body: Stainless steel.
 5. End Connections: Flanged.
 6. Configuration: Designed for horizontal, straight-through flow.
 7. Accessories:
 - a. Valves: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
 - b. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.
- I. Hose-Connection Backflow Preventers:
1. Standard: ASSE 1052.
 2. Operation: Up to 10-foot head of water back pressure.
 3. Inlet Size: NPS 1/2 or NPS 3/4.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

4. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
5. Capacity: At least 3-gpm flow.

J. Backflow-Preventer Test Kits :

1. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators :

1. Standard: ASSE 1003.
2. Pressure Rating: Initial working pressure of 150 psig.
3. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
4. Valves for Booster Heater Water Supply: Include integral bypass.
5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

B. Water-Control Valves :

1. Description: Pilot-operated, diaphragm-type, single-seated, main water-control valve.
2. Pressure Rating: Initial working pressure of 150 psig minimum with AWWA C550 or FDA-approved, interior epoxy coating. Include small pilot-control valve, restrictor device, specialty fittings, and sensor piping.
3. Main Valve Body: Cast- or ductile-iron body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless-steel body.
 - a. Pattern: Globe-valve design.
 - b. Trim: Stainless steel.
4. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.

2.6 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Type: Y-pattern globe valve with two readout ports and memory-setting indicator.
2. Body: Brass or bronze.
3. Size: Same as connected piping, but not larger than NPS 2.
4. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Cast-Iron Calibrated Balancing Valves :

1. Type: Adjustable with Y-pattern globe valve, two readout ports, and memory-setting indicator.
2. Size: Same as connected piping, but not smaller than NPS 2-1/2.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.
- D. Memory-Stop Balancing Valves :
 - 1. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
 - 2. Pressure Rating: 400-psig minimum CWP.
 - 3. Size: NPS 2 or smaller.
 - 4. Body: Copper alloy.
 - 5. Port: Standard or full port.
 - 6. Ball: Chrome-plated brass.
 - 7. Seats and Seals: Replaceable.
 - 8. End Connections: Solder joint or threaded.
 - 9. Handle: Vinyl-covered steel with memory-setting device.

2.7 TEMPERATURE-ACTUATED, WATER MIXING VALVES

- A. Water-Temperature Limiting Devices :
 - 1. Standard: ASSE 1017.
 - 2. Pressure Rating: 125 psig.
 - 3. Type: Thermostatically controlled, water mixing valve.
 - 4. Material: Bronze body with corrosion-resistant interior components.
 - 5. Connections: Threaded union inlets and outlet.
 - 6. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
 - 7. Tempered-Water Setting: 110 F
- B. Primary, Thermostatic, Water Mixing Valves :
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Armstrong International, Inc.](#)
 - b. [Lawler Manufacturing Company, Inc.](#)
 - c. [Leonard Valve Company.](#)
 - d. [Powers.](#)
 - e. [Symmons Industries, Inc.](#)
 - f. [Zurn Industries, LLC.](#)
 - 2. Standard: ASSE 1017.
 - 3. Pressure Rating: 125 psig minimum unless otherwise indicated.
 - 4. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
 - 5. Material: Bronze body with corrosion-resistant interior components.
 - 6. Connections: Threaded union inlets and outlet.
 - 7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
 - 8. Tempered-Water Setting: 110 F
 - 9. Tempered-Water Design Flow Rate: 145 gpm
- C. Manifold, Thermostatic, Water Mixing-Valve Assemblies:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Description: Factory-fabricated, exposed-mounted, thermostatically controlled, water mixing-valve assembly in three-valve parallel arrangement.
2. Large-Flow Parallel: Thermostatic, water mixing valve and downstream-pressure regulator with pressure gages on inlet and outlet.
3. Intermediate-Flow Parallel: Thermostatic, water mixing valve and downstream-pressure regulator with pressure gages on inlet and outlet.
4. Small-Flow Parallel: Thermostatic, water mixing valve.
5. Thermostatic Mixing Valves: Comply with ASSE 1017. Include check stops on hot- and cold-water inlets and shutoff valve on outlet.
6. Water Regulator(s): Comply with ASSE 1003. Include pressure gage on inlet and outlet.
7. Pressure Rating: 125 psig minimum unless otherwise indicated.

D. Individual-Fixture, Water Tempering Valves:

1. Standard: ASSE 1016, thermostatically controlled, water tempering valve.
2. Pressure Rating: 125 psig minimum unless otherwise indicated.
3. Body: Bronze body with corrosion-resistant interior components.
4. Temperature Control: Adjustable.
5. Inlets and Outlet: Threaded.
6. Finish: Rough or chrome-plated bronze.
7. Tempered-Water Setting: 110 F

E. Primary Water Tempering Valves:

1. Standard: ASSE 1017, thermostatically controlled, water tempering valve, listed as tempering valve.
2. Pressure Rating: 125 psig minimum unless otherwise indicated.
3. Body: Bronze.
4. Temperature Control: Manual.
5. Inlets and Outlet: Threaded.

2.8 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.033 inch.
 - b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.
 - c. Strainers NPS 5 and Larger: 0.125 inch.
6. Drain: Factory-installed, hose-end drain valve.

2.9 OUTLET BOXES

A. Clothes Washer Outlet Boxes :

1. Mounting: Recessed.
2. Material and Finish: Enameled-steel, epoxy-painted-steel, or plastic box and faceplate.
3. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
4. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
5. Drain: NPS 2 standpipe and P-trap for direct waste connection to drainage piping.
6. Inlet Hoses: Two 60-inch-long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
7. Drain Hose: One 48-inch-long, rubber household clothes washer drain hose with hooked end.

B. Icemaker Outlet Boxes <Insert drawing designation if any>:

1. Mounting: Recessed.
2. Material and Finish: Enameled-steel, epoxy-painted-steel, or plastic box and faceplate.
3. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
4. Supply Shutoff Fitting: NPS 1/2 gate, globe, or ball valve and NPS 1/2 copper, water tubing.

2.10 HOSE STATIONS

A. Single-Temperature-Water Hose Stations:

1. Standard: ASME A112.18.1.
2. Cabinet: Stainless-steel enclosure with exposed valve handle, hose connection, and hose rack. Include thermometer in front.
3. Hose-Rack Material: Stainless steel.
4. Body Material: Bronze.
5. Body Finish: Rough bronze.
6. Mounting: Wall, with reinforcement.
7. Supply Fittings: NPS 3/4 gate, globe, or ball valve and check valve and NPS 3/4 copper, water tubing. Omit check valve if check stop is included with fitting.
8. Hose: Manufacturer's standard, for service fluid, temperature, and pressure; 50 feet long.
9. Nozzle: With hand-squeeze, on-off control.
10. Vacuum Breaker:
 - a. Integral or factory-installed, nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- b. Garden-hose thread complying with ASME B1.20.7 on outlet.

B. Hot- and Cold-Water Hose Stations:

1. Standard: ASME A112.18.1.
2. Faucet Type: Blending valve.
3. Cabinet: Stainless-steel enclosure with exposed valve handles, hose connection, and hose rack. Include thermometer in front.
4. Hose-Rack Material: Stainless steel.
5. Body Material: Bronze.
6. Body Finish: Rough bronze.
7. Mounting: Wall, with reinforcement.
8. Supply Fittings: Two NPS 3/4 gate, globe, or ball valves and check valves and NPS 3/4 copper, water tubing. Omit check valves if check stops are included with fitting.
9. Hose: Manufacturer's standard, for service fluid, temperature, and pressure; 50 feet long.
10. Nozzle: With hand-squeeze, on-off control.
11. Vacuum Breaker: Integral or factory-installed, nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052; and garden-hose thread complying with ASME B1.20.7 on outlet.

2.11 HOSE BIBBS

A. Hose Bibbs :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg. Co.
 - b. Josam Company.
 - c. MIFAB, Inc.
 - d. Watts; a Watts Water Technologies company.
 - e. Woodford Manufacturing Company.
 - f. Zurn Industries, LLC.
2. Standard: ASME A112.18.1 for sediment faucets.
3. Body Material: Bronze.
4. Seat: Bronze, replaceable.
5. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
6. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
7. Pressure Rating: 125 psig.
8. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
9. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.12 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Jay R. Smith Mfg. Co.](#)
 - b. [Josam Company.](#)
 - c. [MIFAB, Inc.](#)
 - d. [Watts; a Watts Water Technologies company.](#)
 - e. [Woodford Manufacturing Company.](#)
 - f. [Zurn Industries, LLC.](#)
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 or NPS 1.
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounted with cover.
9. Box and Cover Finish: Chrome plated.
10. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
12. Operating Keys(s): Two with each wall hydrant.

B. Nonfreeze, Hot- and Cold-Water Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Jay R. Smith Mfg. Co.](#)
 - b. [Josam Company.](#)
 - c. [MIFAB, Inc.](#)
 - d. [Watts; a Watts Water Technologies company.](#)
 - e. [Woodford Manufacturing Company.](#)
 - f. [Zurn Industries, LLC.](#)
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rods: Of length required to match wall thickness. Include wall clamps.
6. Inlet: NPS 3/4 or NPS 1.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

7. Outlet: Concealed.
8. Box: Deep, flush mounted with cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Vacuum Breaker:
 - a. Nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7 on outlet.
11. Operating Keys(s): Two with each wall hydrant.

C. Moderate-Climate Wall Hydrants:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Jay R. Smith Mfg. Co.](#)
 - b. [Josam Company.](#)
 - c. [MIFAB, Inc.](#)
 - d. [Watts; a Watts Water Technologies company.](#)
 - e. [Woodford Manufacturing Company.](#)
 - f. [Zurn Industries, LLC.](#)
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet:
 - a. Concealed, with integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Outlet:
 - a. Concealed, with integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
11. Operating Keys(s): Two with each wall hydrant.

D. Vacuum Breaker Wall Hydrants :

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Jay R. Smith Mfg. Co.](#)

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- b. [Watts; a Watts Water Technologies company.](#)
 - c. [Woodford Manufacturing Company.](#)
 - d. [Zurn Industries, LLC.](#)
2. Standard: ASSE 1019, Type A or Type B.
 3. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
 4. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
 5. Pressure Rating: 125 psig.
 6. Operation: Loose key.
 7. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
 8. Inlet: NPS 1/2 or NPS 3/4.
 9. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.13 GROUND HYDRANTS

- A. Nonfreeze Ground Hydrants <Insert drawing designation if any>:
 1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
 - a. [Jay R. Smith Mfg. Co.](#)
 - b. [Josam Company.](#)
 - c. [MIFAB, Inc.](#)
 - d. [Watts; a Watts Water Technologies company.](#)
 - e. [Woodford Manufacturing Company.](#)
 - f. [Zurn Industries, LLC.](#)
 2. Standard: ASME A112.21.3M.
 3. Type: Nonfreeze, concealed-outlet ground hydrant with box.
 4. Operation: Loose key.
 5. Casing and Operating Rod: Of at least length required for burial of valve below frost line.
 6. Inlet: NPS 3/4.
 7. Outlet: Garden-hose thread complying with ASME B1.20.7.
 8. Drain: Designed with hole to drain into ground when shut off.
 9. Box: Deep pattern with cover.
 10. Box and Cover Finish: Polished nickel bronze.
 11. Operating Key(s): Two with each ground hydrant.
 12. Vacuum Breaker: ASSE 1011.

2.14 POST HYDRANTS

- A. Nonfreeze, Draining-Type Post Hydrants:
 1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. [Jay R. Smith Mfg. Co.](#)
 - b. [MIFAB, Inc.](#)
 - c. [Watts; a Watts Water Technologies company.](#)
 - d. [Woodford Manufacturing Company.](#)
 - e. [Zurn Industries, LLC.](#)
2. Standard: ASME A112.21.3M.
 3. Type: Nonfreeze, exposed-outlet post hydrant.
 4. Operation: Loose key.
 5. Casing and Operating Rod: Of at least length required for burial of valve below frost line.
 6. Casing: Bronze with casing guard.
 7. Inlet: NPS 3/4.
 8. Outlet: Garden-hose thread complying with ASME B1.20.7.
 9. Drain: Designed with hole to drain into ground when shut off.
 10. Vacuum Breaker:
 - a. Nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7 on outlet.
 11. Operating Key(s): Two with each loose-key-operation wall hydrant.
- B. Nonfreeze, Nondraining-Type Post Hydrants:
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Jay R. Smith Mfg. Co.](#)
 - b. [MIFAB, Inc.](#)
 - c. [Watts; a Watts Water Technologies company.](#)
 - d. [Woodford Manufacturing Company.](#)
 - e. [Zurn Industries, LLC.](#)
 2. Operation: Lever-piston operating mechanism and nondraining water-storage reservoir, designed without drain.
 3. Length: As required for burial of valve below frost line.
 4. Inlet: NPS 1 threaded.
 5. Outlet:
 - a. NPS 1 (DN 25) outlet and coupling plug for 1-inch (25-mm) hose.
 - b. NPS 1 by NPS 3/4 (DN 25 by DN 20) adapter with nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
 - c. Garden-hose thread complying with ASME B1.20.7 on outlet.
 - d. NPS 1 by NPS 3/4 (DN 25 by DN 20) adapter with nonremovable, drainable, hose-connection backflow preventer complying with ASSE 1052.
 - e. Garden-hose thread complying with ASME B1.20.7 on outlet.
- C. Freeze-Resistant Sanitary Yard Hydrants:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg. Co.
 - b. MIFAB, Inc.
 - c. Watts; a Watts Water Technologies company.
 - d. Woodford Manufacturing Company.
 - e. Zurn Industries, LLC.
2. Standard: ASSE 1057, Type 5 for nondraining hydrants.
3. Operation: Wheel handle.
4. Head: Copper alloy, with pail hook.
5. Inlet: NPS 3/4-inch (DN 20) threaded inlet and inlet nozzle, galvanized-steel riser, and venturi.
6. Canister: Zinc-plated steel with atmospheric-vent device.
7. Vacuum Breaker:
 - a. Removable hose-connection backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7 on outlet for field installation.

2.15 DRAIN VALVES

- A. Ball-Valve-Type, Hose-End Drain Valves:
 1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
 2. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
 3. Size: NPS 3/4 (DN 20).
 4. Body: Copper alloy.
 5. Ball: Chrome-plated brass.
 6. Seats and Seals: Replaceable.
 7. Handle: Vinyl-covered steel.
 8. Inlet: Threaded or solder joint.
 9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.
- B. Gate-Valve-Type, Hose-End Drain Valves:
 1. Standard: MSS SP-80 for gate valves.
 2. Pressure Rating: Class 125.
 3. Size: NPS 3/4 (DN 20).
 4. Body: ASTM B 62 bronze.
 5. Inlet: NPS 3/4 (DN 20) threaded or solder joint.
 6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.
- C. Stop-and-Waste Drain Valves <Insert drawing designation if any>:
 1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
 2. Pressure Rating: 200-psig (1380-kPa) minimum CWP or Class 125.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. Size: NPS 3/4 (DN 20).
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 (DN 6) side outlet with cap.

2.16 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters :

1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Metal bellows or Copper tube with piston.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.17 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.
2. Pressure Rating and Temperature: 125-psig (860-kPa) minimum pressure rating at 140 deg F (60 deg C).
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 1/2 (DN 15) minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

B. Welded-Construction Automatic Air Vents:

1. Body: Stainless steel.
2. Pressure Rating: 150-psig (1035-kPa) minimum pressure rating.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 (DN 10) minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

2.18 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Standard: ASSE 1018.
2. Pressure Rating: 125 psig (860 kPa) minimum.
3. Body: Bronze.
4. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
5. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Device:

1. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 (DN 10) minimum, trap makeup connection.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Size: NPS 1-1/4 (DN 32) minimum.
3. Material: Chrome-plated, cast brass.

2.19 TRAP-SEAL PRIMER SYSTEMS

A. Trap-Seal Primer Systems :

1. Standard: ASSE 1044.
2. Piping: NPS 3/4, ASTM B 88, Type L (DN 20, ASTM B 88M, Type B); copper, water tubing.
3. Cabinet: Recessed-mounted steel box with stainless-steel cover.
4. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
 - 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.
5. Vacuum Breaker: ASSE 1001.
6. Number Outlets: Eight.
7. Size Outlets: NPS 1/2 (DN 15).

2.20 SPECIALTY VALVES

- ### **A.**
- Comply with requirements for general-duty metal valves in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

2.21 FLEXIBLE CONNECTORS

- ### **A.**
- Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
1. Working-Pressure Rating: Minimum 200 psig (1380 kPa).
 2. End Connections NPS 2 (DN 50) and Smaller: Threaded copper pipe or plain-end copper tube.
 3. End Connections NPS 2-1/2 (DN 65) and Larger: Flanged copper alloy.
- ### **B.**
- Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
1. Working-Pressure Rating: Minimum 200 psig (1380 kPa).
 2. End Connections NPS 2 (DN 50) and Smaller: Threaded steel-pipe nipple.
 3. End Connections NPS 2-1/2 (DN 65) and Larger: Flanged steel nipple.

2.22 WATER METERS

- A. Displacement-Type Water Meters:
 - 1. Description:
 - a. Standard: AWWA C700.
 - b. Pressure Rating: 150-psig (1035-kPa) working pressure.
 - c. Body Design: Nutating disc; totalization meter.
 - d. Registration: In gallons (liters) or cubic feet (cubic meters) as required by utility company.
 - e. Case: Bronze.
 - f. End Connections: Threaded.
- B. Turbine-Type Water Meters:
 - 1. Description:
 - a. Standard: AWWA C701.
 - b. Pressure Rating: 150-psig (1035-kPa) working pressure.
 - c. Body Design: Turbine; totalization meter.
 - d. Registration: In gallons (liters) or cubic feet (cubic meters) as required by utility company.
 - e. Case: Bronze.
 - f. End Connections for Meters NPS 2 (DN 50) and Smaller: Threaded.
 - g. End Connections for Meters NPS 2-1/2 (DN 65) and Larger: Flanged.
- C. Compound-Type Water Meters:
 - 1. Description:
 - a. Standard: AWWA C702.
 - b. Pressure Rating: 150-psig (1035-kPa) working pressure.
 - c. Body Design: With integral mainline and bypass meters; totalization meter.
 - d. Registration: In gallons (liters) or cubic feet (cubic meters) as required by utility company.
 - e. Case: Bronze.
 - f. Pipe Connections: Flanged.
- D. Remote Registration System: Direct-reading type complying with AWWA C706; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.
- E. Remote Registration System: Encoder type complying with AWWA C707; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install Y-pattern strainers for water on supply side of each control valve and pump.
- B. Install air vents at high points of water piping.

3.2 FIELD QUALITY CONTROL

- A. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- B. Prepare test and inspection reports.

END OF SECTION 221119

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.
- B. Related Section:
 - 1. Section 221313 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.

1.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, 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. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, class.
- B. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
 - 1. Standards: ASTM C 1277 and CISPI 310.
 - 2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- C. Heavy-Duty, Hubless-Piping Couplings:
 - 1. Standards: ASTM C 1277 and ASTM C 1540.
 - 2. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 STAINLESS-STEEL PIPE AND FITTINGS

- A. Pipe and Fittings: ASME A 112.3.1, drainage pattern with socket and spigot ends.
- B. Internal Sealing Rings: Elastomeric gaskets shaped to fit socket groove.

2.5 ABS PIPE AND FITTINGS

- A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- B. Solid-Wall ABS Pipe: ASTM D 2661, Schedule 40.
- C. Cellular-Core ABS Pipe: ASTM F 628, Schedule 40.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- D. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.
- E. Solvent Cement: ASTM D 2235.

2.6 PVC PIPE AND FITTINGS

- A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- C. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
- D. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- E. Adhesive Primer: ASTM F 656.
- F. Solvent Cement: ASTM D 2564.

2.7 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
- B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- C. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
 - 1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- D. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.8 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 - 1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
 - 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 - 3. Unshielded, Nonpressure Transition Couplings:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Standard: ASTM C 1173.
 - b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. Sleeve Materials:
 - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
4. Shielded, Nonpressure Transition Couplings:
- a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- H. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- I. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- J. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- K. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for all piping.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- L. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- M. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- N. Plumbing Specialties:
 - 1. Install backwater valves in sanitary waste gravity-flow piping. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 3. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- C. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- D. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in OD's.
 - 2. In Drainage Piping: Unshielded, nonpressure transition couplings.

3.5 VALVE INSTALLATION

- A. Backwater Valves: Install backwater valves in piping subject to backflow.
 - 1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
 - 2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
 - 3. Install backwater valves in accessible locations.
 - 4. Comply with requirements for backwater valve specified in Section 221319 "Sanitary Waste Piping Specialties."

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
 - 3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
 - 5. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 6. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
 - 5. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for stainless-steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 2: 84 inches with 3/8-inch rod.
 - 2. NPS 3: 96 inches with 1/2-inch rod.
 - 3. NPS 4: 108 inches with 1/2-inch rod.
 - 4. NPS 6: 10 feet with 5/8-inch rod.
- I. Install supports for vertical stainless-steel piping every 10 feet.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- J. Install hangers for ABS and PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 - 2. NPS 3: 48 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
 - 5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.
- K. Install supports for vertical ABS and PVC piping every 48 inches.
- L. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 3. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
 - 5. NPS 6: 10 feet with 5/8-inch rod.
 - 6. NPS 8: 10 feet with 3/4-inch rod.
- M. Install supports for vertical copper tubing every 10 feet.
- N. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 - 5. Install horizontal backwater valves with cleanout cover flush with floor.
 - 6. Comply with requirements for backwater valves cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 7. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.
- E. Do not expose ABS or PVC piping to direct sunlight for more than 30 days. If construction delays are encountered, provide cover to portions of piping exposed to direct sunlight.

3.10 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed ABS and PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.
- E. Repair damage to adjacent materials caused by waste and vent piping installation.

3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping shall be any of the following:
 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
 3. Copper DWV tube, copper drainage fittings, and soldered joints.
 4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - a. When used in plenum returns piping to be completely enclosed in insulation that meets the flame spread index of not more than 25 and a smoke-developed index of not more than 50.
 5. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
 - a. When used in plenum returns piping to be completely enclosed in insulation that meets the flame spread index of not more than 25 and a smoke-developed index of not more than 50.
- C. Underground, soil, waste, and vent piping shall be any of the following:
 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.

END OF SECTION 221316

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Backwater valves.
 - 2. Cleanouts.
 - 3. Floor drains.
 - 4. Trench drains.
 - 5. Channel drainage systems.
 - 6. Air-admittance valves.
 - 7. Roof flashing assemblies.
 - 8. Miscellaneous sanitary drainage piping specialties.
 - 9. Flashing materials.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 BACKWATER VALVES

- A. Horizontal, Cast-Iron Backwater Valves:
 - 1. Standard: ASME A112.14.1.
 - 2. Size: Same as connected piping.
 - 3. Body: Cast iron.
 - 4. Cover: Cast iron with bolted or threaded access check valve.
 - 5. End Connections: Hub and spigot or hubless.
 - 6. Type Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang open for airflow unless subject to backflow condition.
 - 7. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

B. Drain-Outlet Backwater Valves:

1. Size: Same as floor drain outlet.
2. Body: Cast iron or bronze made for vertical installation in bottom outlet of floor drain.
3. Check Valve: Removable ball float.
4. Inlet: Threaded.
5. Outlet: Threaded or spigot.

2.2 CLEANOUTS

A. Exposed Cast-Iron Cleanouts:

1. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
2. Size: Same as connected drainage piping
3. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
4. Closure: Countersunk or raised-head, brass plug.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts:

1. Standard: ASME A112.36.2M for adjustable housing cleanout.
2. Size: Same as connected branch.
3. Type: Adjustable housing.
4. Body or Ferrule: Cast iron.
5. Clamping Device: Required.
6. Outlet Connection: Spigot.
7. Closure: Brass plug with straight threads and gasket.
8. Adjustable Housing Material: Cast iron with threads.
9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Heavy Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Standard: ASME A112.36.2M. Include wall access.
2. Size: Same as connected drainage piping.
3. Body: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
4. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.3 FLOOR DRAINS

A. Cast-Iron Floor Drains (FD)

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Josam Company](#).
 - b. [MIFAB, Inc.](#)
 - c. [Smith, Jay R. Mfg. Co.](#)
 - d. [Watts; a Watts Water Technologies company](#).
 - e. [Zurn Industries, LLC](#).
2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Top of Body and Strainer Finish: Nickel bronze.
6. Top Shape: Square
7. Dimensions of Top or Strainer: 6"
8. Trap Features: Provide with trap guard.

2.4 TRENCH DRAINS

A. Trench Drains :

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Jay R. Smith Mfg. Co.](#)
 - b. [Josam Company](#).
 - c. [MIFAB, Inc.](#)
 - d. [Watts; a Watts Water Technologies company](#).
 - e. [Zurn Industries, LLC](#).
2. Standard: ASME A112.6.3 for trench drains.
3. Material: Ductile or gray iron.
4. Flange: Anchor.
5. Clamping Device: Required.
6. Outlet: Bottom.
7. Grate Material: Ductile iron or gray iron.
8. Grate Finish: Painted.
9. Top Loading Classification: Heavy Duty.
10. Trap Material: Cast iron.
11. Trap Pattern: Standard P-trap.

2.5 CHANNEL DRAINAGE SYSTEMS

A. Stainless-Steel Channel Drainage Systems :

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. ASME A112.3.1, Stainless-Steel Channel Drainage Systems:
 2. Non-ASME A112.3.1, Stainless-Steel Channel Drainage Systems:
 3. Type: Modular system of stainless-steel channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
 - a. Standard: ASME A112.3.1, for trench drains.
 - b. Channel Sections: Interlocking-joint, stainless-steel with level invert.
 - c. Grates: Manufacturer's designation "heavy duty," with slots or perforations, and of width and thickness that fit recesses in channels.
 - 1) Material: Stainless steel.
 - 2) Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.
 - d. Covers: Solid stainless steel, of width and thickness that fit recesses in channels, and of lengths indicated.
 - e. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
 - f. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.
 4. Type: Modular system of stainless-steel channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
 - a. Channel Sections: Interlocking-joint, stainless steel with level invert.
 - b. Grates: Manufacturer's designation "heavy duty," with slots or perforations, and of width and thickness that fit recesses in channels.
 - 1) Material: Stainless steel.
 - 2) Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.
 - c. Covers: Solid stainless steel, of width and thickness that fit recesses in channels, and of lengths indicated.
 - d. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
 - e. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.
- B. Polymer-Concrete Channel Drainage Systems:
1. Narrow, Sloped-Invert, Polymer-Concrete Channel Drainage Systems:
 2. Narrow, Level-Invert, Polymer-Concrete Channel Drainage Systems:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. Wide, Level-Invert, Polymer-Concrete Channel Drainage Systems:
4. Type: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
 - a. Channel Sections: Narrow, interlocking-joint, sloped-invert, polymer-concrete modular units with end caps. Include rounded bottom, with built-in invert slope of 0.6 percent and with outlets in number, sizes, and locations indicated. Include extension sections necessary for required depth.
 - 1) Dimensions: 4-inch inside width. Include number of units required to form total lengths indicated.
 - 2) Frame: Gray-iron or galvanized steel for grates.
 - b. Grates: Manufacturer's designation "heavy duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.
 - c. Covers: Solid ductile or gray iron, of width and thickness that fit recesses in channel sections, and of lengths indicated.
 - d. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
 - e. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.
 - f. Channel Sections: Narrow, interlocking-joint, precast, polymer-concrete modular units with end caps. Include rounded bottom, with level invert and with NPS 4 outlets in number and locations indicated.
 - 1) Frame: Gray-iron or galvanized steel for grates.
 - g. Grates: Manufacturer's designation "heavy duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.
 - h. Covers: Solid ductile or gray iron, of width and thickness that fit recesses in channel sections, and of lengths indicated.
 - i. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
 - j. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.
 - k. Channel Sections: Wide, interlocking-joint, precast, polymer-concrete modular units with end caps. Include flat or rounded bottom, with level invert and with outlets in number, sizes, and locations indicated.
 - l. Grates: Manufacturer's designation "heavy duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.
 - m. Covers: Solid ductile or gray iron, of width and thickness that fit recesses in channel sections, and of lengths indicated.
 - n. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- o. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.6 ROOF FLASHING ASSEMBLIES

- A. Roof Flashing Assemblies:
 - 1. Description: Manufactured assembly made of 6.0-lb/sq. ft., 0.0938-inch-thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
 - a. Low-Silhouette Vent Cap: With vandal-proof vent cap.

2.7 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

- A. Stack Flashing Fittings:
 - 1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
 - 2. Size: Same as connected stack vent or vent stack.
- B. Vent Caps:
 - 1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
 - 2. Size: Same as connected stack vent or vent stack.

2.8 FLASHING MATERIALS

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
 - 1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
 - 2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
 - 3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.
- B. Fasteners: Metal compatible with material and substrate being fastened.
- C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- D. Solder: ASTM B 32, lead-free alloy.
- E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

3.1 INSTALLATION

- A. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 - 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 - 4. Locate at base of each vertical soil and waste stack.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 - 1. Position floor drains for easy access and maintenance.
 - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
 - 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 - 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- H. Install deep-seal traps on floor drains and other waste outlets.
- I. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 - 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 - 2. Size: Same as floor drain inlet.
- J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- K. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- L. Install vent caps on each vent pipe passing through roof.
- M. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.
 - 1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.
 - 2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.
 - 3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
 - 4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.
- N. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Grease Interceptors: Connect inlet and outlet to unit, and connect flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

3.3 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each grease interceptor.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 223300 - ELECTRIC, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Thermostat-control, electric, tankless, domestic-water heaters.
 - 2. Domestic-water heater accessories.

1.2 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 and the unit will be fully operational after the seismic event."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated.
- B. Shop Drawings:
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For commercial domestic-water heaters, accessories, and components, from manufacturer.
- B. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- C. Source quality-control reports.
- D. Field quality-control reports.
- E. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
1.6 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, "Drinking Water System Components - Health Effects."

1.7 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. Warranty Periods: From date of Substantial Completion.
 - a. Commercial, Electric, Domestic-Water Booster Heaters:
 - 1) Controls and Other Components: Five years.
 - b. Commercial, Electric, Storage, Domestic-Water Heaters:
 - 1) Storage Tank: Five years.
 - 2) Controls and Other Components: Five years.
 - c. Commercial, Light-Duty, Storage, Electric, Domestic-Water Heaters:
 - 1) Storage Tank: Five 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: Three years.
 - e. Electric, Tankless, Domestic-Water Heaters: Five year(s).
 - f. Compression Tanks: Five years.

2.1 ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS

A. Thermostat-Control, Electric, Tankless, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bosch Water Heating.
 - b. Eemax.
 - c. E-Tankless Water Heaters Corp.
 - d. Insinkerator.
2. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.
3. Construction: Copper piping or tubing complying with NSF 61 Annex barrier materials for potable water, without storage capacity.
 - a. Connections: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: 150 psig.
 - 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.

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Bell & Gossett.
 - c. Smith, A. O. Corporation.
 - d. State Industries.
 - e. Taco, 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- b. Interior Finish: Comply with NSF 61 Annex barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Air-Charging Valve: Factory installed.
4. Characteristics:
- a. Working-Pressure Rating: 150 psig.
- 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 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 or ASHRAE 90.2.
- D. Heat-Trap Fittings: ASHRAE 90.2.
- E. Pressure-Reducing Valves: ASSE 1003 for water. Set at 25-psig-maximum outlet pressure unless otherwise indicated.
- F. 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.
- G. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than domestic-water heater working-pressure rating.
- H. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.
- I. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.
- J. 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 above the floor.
- K. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.
- 2.3 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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 Section 033000 "Cast-in-Place Concrete." Section 033053 "Miscellaneous Cast-in-Place Concrete."
 - 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 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 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 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. Comply with requirements for pressure-reducing valves and water hammer arresters specified in Section 221119 "Domestic Water Piping Specialties."
- K. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.
- L. Fill electric, domestic-water heaters with water.
- M. Charge domestic-water compression tanks with air.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
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.

END OF SECTION 223300

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 224216.13 - COMMERCIAL LAVATORIES & SINKS

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. Service basins.
 - 2. Service sinks.
 - 3. Utility sinks
 - 4. Lavatories
 - 5. Sinks
 - 6. Sink faucets.
 - 7. Laminar-flow, faucet-spout outlets.
 - 8. Supply fittings.
 - 9. Waste fittings.
- B. Related Requirements:
 - 1. Section 224100 "Residential Plumbing Fixtures" for residential sinks.

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 sinks.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sinks to include in maintenance manuals.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
 - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 SERVICE BASINS

- A. Service Basins : Terrazzo, floor mounted.
 - 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Acorn Engineering Company.](#)
 - b. [Crane Plumbing, L.L.C.](#)
 - c. Fiat.
 - d. [Florestone Products Co., Inc.](#)
 - 2. Fixture:
 - a. Standard: IAPMO PS 99.
 - b. Tiling Flange: On three sides.
 - c. Rim Guard: On all top surfaces.
 - d. Color: by Arch.
 - e. Drain: Grid with NPS 3 outlet.
 - 3. Mounting: On floor and flush to wall.
- B. Service Basins: Plastic, floor mounted.
 - 1. Fixture:
 - a. Standard: IAPMO/ANSI Z124.6.
 - b. Material: Cast polymer.
 - c. Nominal Size: 36 by 36 by 10 inches.
 - d. Color: By Arch.
 - e. Drain: Grid with NPS 3 outlet.
 - 2. Mounting: On floor and flush to wall.

2.2 LAVATORIES

- A. Lavatory L-1 & L-2: Oval, under-mount, vitreous China.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. **Manufacturers:** Shall be one of the following:
 - a. [American Standard America.](#)
 - b. [Bradley Corporation.](#)
 - c. [Chicago Faucets; Geberit Company.](#)
 - d. [Delta Faucet Company.](#)
 - e. [Eljer, Inc.](#)
 - f. [Elkay Manufacturing Co.](#)
 - g. [GROHE America, Inc.](#)
 - h. [Just Manufacturing.](#)
 - i. [Kohler Co.](#)
 - j. [Moen Incorporated.](#)
 - k. [Price Pfister, Inc.](#)
 - l. [Speakman Company.](#)
 - m. [T & S Brass and Bronze Works, Inc.](#)
 - n. [Zurn Industries, LLC.](#)
 - o. Sloan

2. Fixture:
 - a. Standard: ASME A112.19.1/CSA B45.2.
 - b. Type: For undercounter mounting.
 - c. Nominal Size: Oval, 19 by 16 inches.
 - d. Faucet-Hole Punching: No holes.
 - e. Faucet-Hole Location: On countertop.
 - f. Color: White.
 - g. Mounting Materials: Sealant and undercounter mounting kit.

2.3 SINKS

- A. Sinks S-1: Stainless steel, counter mounted. Elkay ELUHAD or equal by below manufacturers.
 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Advance Tabco.](#)
 - b. [Elkay Manufacturing Co.](#)
 - c. [Just Manufacturing.](#)

 2. Fixture:
 - a. Standard: ASME A112.19.3/CSA B45.4.
 - b. Type: Ledge back.
 - c. Number of Compartments: Two
 - d. Material: 304, 18-8 Stainless Steel, 18 Gauge
 - e. Holes: No holes
 - f. Mounting Type: Undermount

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Sinks S-2: Stainless steel, counter mounted. Elkay ELUHAD or equal by below manufacturers.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Tabco.
 - b. Elkay Manufacturing Co.
 - c. Just Manufacturing.
 - 2. Fixture:
 - a. Standard: ASME A112.19.3/CSA B45.4.
 - b. Type: Ledge back.
 - c. Number of Compartments: One
 - d. Material: 304, 18-8 Stainless Steel, 18 Gauge
 - e. Holes: No holes
 - f. Mounting Type: Undermount
- C. Retain "Compartment" Subparagraph below for single-compartment sinks.

2.4 SINK FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.
- B. Sink Faucets for S-1 & S-2: Manual type, single lever, ADA compliant
 - 1. Commercial, Polished Chrome. Centurion 111E-BN or equal by below manufacturers.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) American Standard America.
 - 2) Bradley Corporation.
 - 3) Chicago Faucets; Geberit Company.
 - 4) Delta Faucet Company.
 - 5) Eljer, Inc.
 - 6) Elkay Manufacturing Co.
 - 7) GROHE America, Inc.
 - 8) Just Manufacturing.
 - 9) Kohler Co.
 - 10) Moen Incorporated.
 - 11) Price Pfister, Inc.
 - 12) Sloan
 - 13) Speakman Company.
 - 14) T & S Brass and Bronze Works, Inc.
 - 15) Zurn Industries, LLC.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
4. Body Type: Single hole.
5. Body Material: General-duty, brushed nickel
6. Finish: Brushed
7. Maximum Flow Rate: 1.5 gpm.
8. Handle(s): Lever.
9. Mounting Type: Deck, exposed.
10. Spout Type: Stationary type.

C. Sink Faucets for L-1: Automatic-type, battery-powered, electronic-sensor-operated, mixing, solid-brass valve.

1. Commercial, Polished Chrome. Sloan EBF-650 or equal by below manufacturers.
 - a. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - 1) [American Standard America.](#)
 - 2) [Bradley Corporation.](#)
 - 3) [Chicago Faucets; Geberit Company.](#)
 - 4) [Delta Faucet Company.](#)
 - 5) [Eljer, Inc.](#)
 - 6) [Elkay Manufacturing Co.](#)
 - 7) [GROHE America, Inc.](#)
 - 8) [Just Manufacturing.](#)
 - 9) [Kohler Co.](#)
 - 10) [Moen Incorporated.](#)
 - 11) [Price Pfister, Inc.](#)
 - 12) Sloan
 - 13) [Speakman Company.](#)
 - 14) [T & S Brass and Bronze Works, Inc.](#)
 - 15) [Zurn Industries, LLC.](#)

2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
4. Body Type: Single hole.
5. Body Material: General-duty, chrome plated
6. Finish: Brushed
7. Maximum Flow Rate: 0.5 gpm.
8. Handle(s): Automatic, battery powered, electronic sensor operated
9. Mounting Type: Deck, exposed.
10. Spout Type: Stationary type.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.5 LAMINAR-FLOW, FAUCET-SPOUT OUTLETS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex 61, "Drinking Water System Components - Health Effects," for faucet-spout-outlet materials that will be in contact with potable water.
- B. Description: Chrome-plated brass, faucet-spout outlet that produces non-aerating, laminar stream. Include external or internal thread that mates with faucet outlet for attachment to faucets where indicated and flow-rate range that includes flow of faucet.

2.6 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.
- D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- E. Operation: Loose key.

2.7 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.
- C. Trap:
 - 1. Size: NPS 1-1/2.
 - 2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.
 - 3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless-steel tube to wall; and stainless-steel wall flange.

2.8 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.
- B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install sinks level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-hung sinks.
- C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.
- D. Set floor-mounted sinks in leveling bed of cement grout.
- E. Install water-supply piping with stop on each supply to each sink faucet.
 - 1. Exception: Use ball or gate valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
 - 2. Install stops in locations where they can be easily reached for operation.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

- A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

- A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. After completing installation of sinks, inspect and repair damaged finishes.
- B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed sinks and fittings.
- D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.16

SECTION 224713 - DRINKING FOUNTAINS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes drinking fountains and related components.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of drinking fountains.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For drinking fountains to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 DRINKING FOUNTAINS

- A. Drinking Fountains: Electric bi-level wall mounted with water bottle filler
 - 1. Drinking Fountains:
 - a. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - 1) [Elkay Manufacturing Co.](#)
 - 2) [Haws Corporation.](#)
 - 3) Oasis
 - 2. Standards:
 - a. Comply with ASME A112.19.3/CSA B45.4.
 - b. Comply with NSF 61 Annex G.
 - 3. Type Receptor: With back.
 - 4. Receptor Shape: Rectangular
 - 5. Back Panel: Stainless-steel wall plate behind drinking fountain.
 - 6. Bubblers: Two, with adjustable stream regulator, located on deck.
 - 7. Water Bottle Filler: One with filter
 - 8. Control: Push button.
 - 9. Drain: Grid type with NPS 1-1/4 tailpiece.
 - 10. Supply Piping: NPS 3/8 with shutoff valve.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

11. Drain Piping: ASME A112.18.2/CSA B125.2, NPS 1-1/4 chrome-plated brass P-trap and waste.
12. Support: ASME A112.6.1M, Type III lavatory carrier.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.
- B. Examine walls and floors for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.
- B. Set pedestal drinking fountains on floor.
- C. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.
- D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball or gate valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
- E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- G. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- H. Adjust fixture flow regulators for proper flow and stream height.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Install ball or gate shutoff valve on water supply to each fixture. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
- D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 CLEANING

- A. After installation, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.
- C. Provide protective covering for installed fixtures.
- D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224713

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 5500 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Rotor: Random-wound, squirrel cage.
- F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- G. Temperature Rise: Match insulation rating.
- H. Insulation: Class F.
- I. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Sleeve-seal systems.
 - 3. Grout.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Stainless steel.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves.
 - b. Piping NPS 6 and Larger: Cast-iron wall sleeves.
 - 2. Exterior Concrete Walls below Grade:
 - a. Piping : Cast-iron wall sleeves with sleeve-seal system].
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs-on-Grade:
 - a. Piping : Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 4. Concrete Slabs above Grade:
 - a. Piping : PVC-pipe sleeves.
 - 5. Interior Partitions:
 - a. Piping : Galvanized-steel-sheet sleeves.

END OF SECTION 230517

SECTION 230519 - METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Bimetallic-actuated thermometers.
 - 2. Liquid-in-glass thermometers.
 - 3. Thermowells.
 - 4. Dial-type pressure gages.
 - 5. Gage attachments.
 - 6. Pitot-tube flowmeters.
 - 7. Turbine flowmeters.
 - 8. Venturi flowmeters.
 - 9. Impeller-turbine, thermal-energy meters.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Wiring Diagrams: For power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

- A. Standard: ASME B40.200.
- B. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch nominal diameter.
- C. Dial: Nonreflective aluminum with permanently etched scale markings and scales in **deg F**
- D. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- E. Connector Size: 1/2 inch, with ASME B1.1 screw threads.
- F. Stem: 0.25 or 0.375 inch in diameter; stainless steel.
- G. Window: plastic.
- H. Ring: Stainless steel.
- I. Element: Bimetal coil.
- J. Pointer: Dark-colored metal.
- K. Accuracy: Plus or minus 1 percent of scale range.

2.2 LIQUID-IN-GLASS THERMOMETERS

- A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
 - 1. Standard: ASME B40.200.
 - 2. Case: Cast aluminum; 7-inch nominal size unless otherwise indicated.
 - 3. Case Form: Adjustable angle unless otherwise indicated.
 - 4. Tube: Glass with magnifying lens and blue[**or red**] organic liquid.
 - 5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
 - 6. Window: plastic.
 - 7. Stem: Aluminum and of length to suit installation.
 - a. Design for Air-Duct Installation: With ventilated shroud.
 - b. Design for Thermowell Installation: Bare stem.
 - 8. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
 - 9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.
- B. Plastic-Case, Industrial-Style, Liquid-in-Glass Thermometers:
 - 1. Standard: ASME B40.200.
 - 2. Case: Plastic; 7-inch nominal size unless otherwise indicated.
 - 3. Case Form: Adjustable angle unless otherwise indicated.
 - 4. Tube: Glass with magnifying lens and blue organic liquid.
 - 5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in **deg F**.
 - 6. Window: plastic.
 - 7. Stem: Aluminum and of length to suit installation.
 - a. Design for Air-Duct Installation: With ventilated shroud.
 - b. Design for Thermowell Installation: Bare stem.
 - 8. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
 - 9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3 DUCT-THERMOMETER MOUNTING BRACKETS

- A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.4 THERMOWELLS

- A. Thermowells:
 - 1. Standard: ASME B40.200.
 - 2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
 - 3. Material for Use with Copper Tubing: CNR or CUNI.
 - 4. Material for Use with Steel Piping: CRES.
 - 5. Type: Stepped shank unless straight or tapered shank is indicated.
 - 6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
 - 7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
 - 8. Bore: Diameter required to match thermometer bulb or stem.
 - 9. Insertion Length: Length required to match thermometer bulb or stem.
 - 10. Lagging Extension: Include on thermowells for insulated piping and tubing.
 - 11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.
- B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.5 PRESSURE GAGES

- A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
 - 1. Standard: ASME B40.100.
 - 2. Case: Liquid-filled type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
 - 3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
 - 4. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
 - 5. Movement: Mechanical, with link to pressure element and connection to pointer.
 - 6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
 - 7. Pointer: Dark-colored metal.
 - 8. Window: plastic.
 - 9. Ring: Metal.
 - 10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.
- B. Direct-Mounted, Plastic-Case, Dial-Type Pressure Gages:
 - 1. Standard: ASME B40.100.
 - 2. Case: Sealed type; plastic; 4-1/2-inch nominal diameter.
 - 3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
 - 4. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: plastic.
9. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

C. Remote-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Standard: ASME B40.100.
2. Case: Liquid-filled type; cast aluminum or drawn steel; 4-1/2-inch nominal diameter with back flange and holes for panel mounting.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: plastic.
9. Ring: Metal.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.6 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.
- B. Siphons: Loop-shaped section of stainless-steel pipe with NPS 1/4 or NPS 1/2 pipe threads.
- C. Valves: Brass ball, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.7 FLOWMETERS

A. Pitot-Tube Flowmeters:

1. Description: Flowmeter with sensor and indicator.
2. Flow Range: Sensor and indicator shall cover operating range of equipment or system served.
3. Sensor: Insertion type; for inserting probe into piping and measuring flow directly in gallons per minute.
 - a. Design: Differential-pressure-type measurement for [oil] [water] <Insert fluid>.
 - b. Construction: Stainless-steel probe of length to span inside of pipe, with integral transmitter and direct-reading scale.
 - c. Minimum Pressure Rating: 150 psig.
 - d. Minimum Temperature Rating: 250 deg F.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

4. Indicator: Hand-held meter; either an integral part of sensor or a separate meter.
5. Integral Transformer: For low-voltage power connection.
6. Accuracy: Plus or minus 2 percent.
7. Display: Shows rate of flow, with register to indicate total volume in gallons.
8. Operating Instructions: Include complete instructions with each flowmeter.

B. Turbine Flowmeters:

1. Description: Flowmeter with sensor and indicator.
2. Flow Range: Sensor and indicator shall cover operating range of equipment or system served.
3. Sensor: Impeller turbine; for inserting into pipe fitting or for installing in piping and measuring flow directly in gallons per minute.
 - a. Design: Device or pipe fitting with inline turbine and integral direct-reading scale for water.
 - b. Construction: Bronze or stainless-steel body, with plastic turbine or impeller.
 - c. Minimum Pressure Rating: 150 psig.
 - d. Minimum Temperature Rating: 180 deg F.
4. Indicator: Hand-held meter; either an integral part of sensor or a separate meter.
5. Accuracy: Plus or minus 1-1/2 percent.
6. Display: Shows rate of flow, with register to indicate total volume in gallons.
7. Operating Instructions: Include complete instructions with each flowmeter.

C. Venturi Flowmeters:

1. Description: Flowmeter with calibrated flow-measuring element, hoses or tubing, fittings, valves, indicator, and conversion chart.
2. Flow Range: Sensor and indicator shall cover operating range of equipment or system served.
3. Sensor: Venturi-type, calibrated, flow-measuring element; for installation in piping.
 - a. Design: Differential-pressure-type measurement for water.
 - b. Construction: Bronze, brass, or factory-primed steel, with brass fittings and attached tag with flow conversion data.
 - c. Minimum Pressure Rating: 250 psig.
 - d. Minimum Temperature Rating: 250 deg F.
 - e. End Connections for NPS 2 and Smaller: Threaded.
 - f. End Connections for NPS 2-1/2 and Larger: Flanged or welded.
 - g. Flow Range: Flow-measuring element and flowmeter shall cover operating range of equipment or system served.
4. Permanent Indicators: Meter suitable for wall or bracket mounting, calibrated for connected flowmeter element, and having 6-inch-diameter, or equivalent, dial with fittings and copper tubing for connecting to flowmeter element.
 - a. Scale: Gallons per minute.
 - b. Accuracy: Plus or minus 1 percent between 20 and 80 percent of scale range.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

5. Portable Indicators: Hand-held, differential-pressure type, calibrated for connected flowmeter element and having two 12-foot hoses, with carrying case.
 - a. Scale: Gallons per minute.
 - b. Accuracy: Plus or minus 2 percent between 20 and 80 percent of scale range.
6. Display: Shows rate of flow, with register to indicate total volume in gallons.
7. Conversion Chart: Flow rate data compatible with sensor.
8. Operating Instructions: Include complete instructions with each flowmeter.

2.8 THERMAL-ENERGY METERS

A. Impeller-Turbine, Thermal-Energy Meters:

1. Description: System with strainer, flow sensor, temperature sensors, transmitter, indicator, and connecting wiring.
2. Flow Sensor: Impeller turbine with corrosion-resistant-metal body and transmitter; for installing in piping.
 - a. Design: Total thermal-energy measurement.
 - b. Minimum Pressure Rating: 150 psig.
 - c. Minimum Temperature Range: 40 to 250 deg F (5 to 121 deg C).
3. Temperature Sensors: Insertion-type transducer.
4. Indicator: Solid-state, integrating-type meter with integral battery pack; for wall mounting.
 - a. Data Output: Six-digit electromechanical counter with readout in kilowatts per hour or British thermal units.
 - b. Battery Pack: Five-year lithium battery.
5. Accuracy: Plus or minus 1 percent.
6. Display: Visually indicates total fluid volume in gallons and thermal-energy flow in kilowatts per hour or British thermal units.
7. Strainer: Full size of main line piping.
8. Operating Instructions: Include complete instructions with each thermal-energy meter system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.
- G. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.
- H. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- I. Install remote-mounted pressure gages on panel.
- J. Install valve and snubber in piping for each pressure gage for fluids (except steam).
- K. Install valve and syphon fitting in piping for each pressure gage for steam.
- L. Install flow indicators in piping systems in accessible positions for easy viewing.
- M. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.
- N. Install flowmeter elements in accessible positions in piping systems.
- O. Install differential-pressure-type flowmeter elements, with at least minimum straight lengths of pipe, upstream and downstream from element according to manufacturer's written instructions.
- P. Install permanent indicators on walls or brackets in accessible and readable positions.
- Q. Install connection fittings in accessible locations for attachment to portable indicators.
- R. Mount thermal-energy meters on wall if accessible; if not, provide brackets to support meters.
- S. Install thermometers in the following locations:
 - 1. Inlet and outlet of each hydronic zone.
 - 2. Inlet and outlet of each hydronic boiler.
 - 3. Two inlets and two outlets of each chiller.
 - 4. Inlet and outlet of each hydronic coil in air-handling units.
 - 5. Two inlets and two outlets of each hydronic heat exchanger.
 - 6. Inlet and outlet of each thermal-storage tank.
 - 7. Outside-, return-, supply-, and mixed-air ducts.
- T. Install pressure gages in the following locations:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Discharge of each pressure-reducing valve.
2. Inlet and outlet of each chiller chilled-water and condenser-water connection.
3. Suction and discharge of each pump.

3.2 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.
- B. Connect flowmeter-system elements to meters.
- C. Connect flowmeter transmitters to meters.
- D. Connect thermal-energy meter transmitters to meters.

3.3 ADJUSTING

- A. After installation, calibrate meters according to manufacturer's written instructions.
- B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

- A. Thermometers at inlet and outlet of each hydronic zone shall be [**one of**] the following:
 1. Liquid-filled, bimetallic-actuated type.
 2. Industrial-style, liquid-in-glass type.
- B. Thermometers at inlet and outlet of each hydronic boiler shall be one of the following:
 1. Liquid-filled, bimetallic-actuated type.
 2. Industrial-style, liquid-in-glass type.
- C. Thermometers at inlets and outlets of each chiller shall be one of the following:
 1. Liquid-filled, bimetallic-actuated type.
 2. Industrial-style, liquid-in-glass type.
- D. Thermometers at inlet and outlet of each hydronic coil in air-handling units and built-up central systems shall be one of the following:
 1. Liquid-filled, bimetallic-actuated type.
 2. Industrial-style, liquid-in-glass type.
- E. Thermometers at inlets and outlets of each hydronic heat exchanger shall be one of the following:
 1. Liquid-filled, bimetallic-actuated type.
 2. Industrial-style, liquid-in-glass type.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- F. Thermometers at inlet and outlet of each hydronic heat-recovery unit shall be [**one of**] the following:
 - 1. Liquid-filled, bimetallic-actuated type.
 - 2. Industrial-style, liquid-in-glass type.
- G. Thermometers at inlet and outlet of each thermal-storage tank shall be one of the following:
 - 1. Liquid-filled, bimetallic-actuated type.
 - 2. Industrial-style, liquid-in-glass type.
- H. Thermometers at outside-, return-, supply-, and mixed-air ducts shall be one of the following:
 - 1. Liquid-filled, bimetallic-actuated type.
 - 2. Industrial-style, liquid-in-glass type.
- I. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Chilled-Water Piping: 0 to 100 deg F.
- B. Scale Range for Condenser-Water Piping: 0 to 150 deg F.
- C. Scale Range for Heating, Hot-Water Piping: 20 to 240 deg F.
- D. Scale Range for Steam and Steam-Condensate Piping: 20 to 240 deg F.
- E. Scale Range for Air Ducts: 0 to 150 deg F.

3.6 PRESSURE-GAGE SCHEDULE

- A. Pressure gages at discharge of each pressure-reducing valve shall be the following:
 - 1. Liquid-filled, direct-mounted, metal case.
- B. Pressure gages at inlet and outlet of each chiller chilled-water and condenser-water connection shall be the following:
 - 1. Liquid-filled, direct-mounted, metal case.
- C. Pressure gages at suction and discharge of each pump shall be the following:
 - 1. Liquid-filled, direct-mounted, metal case.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Hydronic Piping: 0 to 100 psi.
- B. Scale Range for Steam Piping: 0 to 160 psi.

3.8 FLOWMETER SCHEDULE

- A. Flowmeters for Chilled-Water Piping: Pitot-tube, Turbine, or Venturi type.
- B. Flowmeters for Condenser-Water Piping: Pitot-tube, Turbine, or Venturi type.
- C. Flowmeters for Heating, Hot-Water Piping: Pitot-tube, Turbine, or Venturi type.
- D. Flowmeters for Steam and Steam-Condensate Piping: Venturi type.

3.9 THERMAL-ENERGY METER SCHEDULE

- A. Thermal-Energy Meters: Impeller-turbine type.

END OF SECTION 230519

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Thermal-hanger shield inserts.
 - 4. Fastener systems.
 - 5. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:
 - 1. Trapeze pipe hangers.
 - 2. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers 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 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Stainless-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
- C. Copper Pipe Hangers:
 - 1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
 - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- L. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
 - 5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
 - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and 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. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in architectural specifications.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 - 6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 - 9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 - 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 - 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 - 6. C-Clamps (MSS Type 23): For structural shapes.
 - 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 - 8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 - 9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 - 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 - 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 - 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 - 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

- Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 230548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Elastomeric isolation pads.
 2. Elastomeric isolation mounts.
 3. Restrained elastomeric isolation mounts.
 4. Open-spring isolators.
 5. Housed-spring isolators.
 6. Restrained-spring isolators.
 7. Housed-restrained-spring isolators.
 8. Pipe-riser resilient supports.
 9. Resilient pipe guides.
 10. Elastomeric hangers.
 11. Spring hangers.
 12. Snubbers.
 13. Restraint channel bracings.
 14. Restraint cables.
 15. Seismic-restraint accessories.
 16. Mechanical anchor bolts.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.
1. Include design calculations and details for selecting vibration isolators and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

- C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Wind-Restraint Loading:
 - 1. Ultimate Design Wind Speed: 115 MPH
 - 2. Building Classification Category: II.
 - 3. Minimum 10 lb/sq. ft. multiplied by maximum area of HVAC component projected on vertical plane normal to wind direction, and 45 degrees either side of normal.

- B. Seismic-Restraint Loading:
 - 1. Site Class as Defined in the IBC: D.
 - 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: II.
 - a. Component Importance Factor: 1.0.

2.2 ELASTOMERIC ISOLATION PADS

- A. Elastomeric Isolation Pads: .
 - 1. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
 - 2. Size: Factory or field cut to match requirements of supported equipment.
 - 3. Pad Material: Oil and water resistant with elastomeric properties.
 - 4. Surface Pattern: Waffle pattern.
 - 5. Infused nonwoven cotton or synthetic fibers.
 - 6. Load-bearing metal plates adhered to pads.

2.3 ELASTOMERIC ISOLATION MOUNTS

- A. Double-Deflection, Elastomeric Isolation Mounts: .
 - 1. Mounting Plates:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
 - b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.
2. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts: .

1. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 - a. Housing: Cast-ductile iron or welded steel.
 - b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators: .

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.6 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing: .

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
- b. Top housing with attachment and leveling bolt.

2.7 RESTRAINED-SPRING ISOLATORS

- A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint: .
 1. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.
 - a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
 - b. Top plate with threaded mounting holes.
 - c. Internal leveling bolt that acts as blocking during installation.
 2. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
 3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.8 HOUSED-RESTRAINED-SPRING ISOLATORS

- A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing: .
 1. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with adjustable snubbers to limit vertical movement.
 - a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
 - b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.
 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.9 PIPE-RISER RESILIENT SUPPORT

- A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch-thick neoprene.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
2. Maximum Load Per Support: 500 psigon isolation material providing equal isolation in all directions.

2.10 RESILIENT PIPE GUIDES

- A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch-thick neoprene.
1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.11 ELASTOMERIC HANGERS

- A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods: .
1. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.12 SPRING HANGERS

- A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression: .
1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
 7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
 8. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

2.13 SNUBBERS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - 1. [Kinetics Noise Control, Inc.](#)
 - 2. [Mason Industries, Inc.](#)
 - 3. [Vibration Mountings & Controls, Inc.](#)
- B. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
 - 1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
 - 2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
 - 3. Maximum 1/4-inch air gap, and minimum 1/4-inch-thick resilient cushion.

2.14 RESTRAINT CHANNEL BRACINGS

- A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.15 RESTRAINT CABLES

- A. Restraint Cables: ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.16 SEISMIC-RESTRAINT ACCESSORIES

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - 1. [B-line, an Eaton business.](#)
 - 2. [Kinetics Noise Control, Inc.](#)
 - 3. [Mason Industries, Inc.](#)
- B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.2 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete." [Section 033053 "Miscellaneous Cast-in-Place Concrete."
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.
- C. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.
- D. Equipment Restraints:
 - 1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
 - 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 3. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES that provides required submittals for component.
- E. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 3. Brace a change of direction longer than 12 feet.
- F. Install cables so they do not bend across edges of adjacent equipment or building structure.
- G. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES that provides required submittals for component.
- H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- I. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- J. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- K. Drilled-in Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
 5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 2321 13 "Hydronic Piping" for piping flexible connections.

3.4 FIELD QUALITY CONTROL

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
 - 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 - 4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
 - 5. Test to 90 percent of rated proof load of device.
 - 6. Measure isolator restraint clearance.
 - 7. Measure isolator deflection.
 - 8. Verify snubber minimum clearances.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust isolators after piping system is at operating weight.
- B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION 230548

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Duct labels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Material and Thickness: aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Letter Color: Black.
 - 3. Background Color: White.
 - 4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 - 6. Fasteners: Stainless-steel rivets or self-tapping screws.
 - 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: Black.
 - 3. Background Color: White.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: White.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

2.4 DUCT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: White.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified by architect.
- B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Pipe Label Color Schedule:
 - 1. Chilled-Water Piping: White letters on a safety-green background.
 - 2. Condenser-Water Piping: White letters on a safety-green background.
 - 3. Heating Water Piping: White letters on a safety-green background.
 - 4. Refrigerant Piping: Black letters on a safety-orange background.
 - 5. Low-Pressure Steam Piping: White letters on a safety-purple background.
 - 6. High-Pressure Steam Piping: White letters on a safety-purple background.
 - 7. Steam Condensate Piping: White letters on a safety-purple background.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3.4 DUCT LABEL INSTALLATION

- A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
 - 1. Blue: For cold-air supply ducts.
 - 2. Yellow: For hot-air supply ducts.
 - 3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.

- B. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION 230553

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 230593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

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. Balancing Air Systems:
 - a. Constant-volume air systems.
 - b. Dual-Duct Systems
 - c. Variable-air-volume systems.
 - 2. Balancing Hydronic Systems:
 - a. Constant-volume air systems.
 - b. Variable-volume systems.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 15 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- D. Certified TAB reports.
- E. Sample report forms.
- F. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.
 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or NEBB.
 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.
- B. Certify TAB field data reports and perform the following:
 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use standard TAB contractor's forms approved by Owner.
- D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."
- E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.6 PROJECT SCOPE

- A. Balance all air systems & hydronic piping as indicated on plans.

1.7 PROJECT CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.8 COORDINATION

- A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- B. Perform TAB after leakage and pressure tests on air distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 TAB SPECIALISTS

- A. Subject to compliance with requirements, engage one of the following:
 1. Certified Test and Balance.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Bonneville Test and Balance.
3. BTC Test and Balance.
4. Diamond Test and Balance.
5. R and S Analysis
6. Intermountain Test and Balance
7. Test and Balancing, Inc.
8. Independent Test and Balance

3.2 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- F. Examine test reports specified in individual system and equipment Sections.
- G. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- H. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- I. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.
- J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- K. Examine operating safety interlocks and controls on HVAC equipment.
- L. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
 1. Permanent electrical-power wiring is complete.
 2. Automatic temperature-control systems are operational.
 3. Equipment and duct access doors are securely closed.
 4. Balance, smoke, and fire dampers are open.
 5. Isolating and balancing valves are open and control valves are operational.
 6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 7. Windows and doors can be closed so indicated conditions for system

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

operations can be met.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", or ASHRAE 111-1988, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems".
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. All instruments used by the Contractor shall have been calibrated within the previous 12 months. The final balance report shall contain copies of calibration documents showing calibration tolerances, date of calibration and calibrating firm.
- E. Air and water quantities shall be balanced to within 5% of the quantities shown.
- F. Balance air flow at duct branch damper with outlet dampers full open.
- G. Test, adjust and record fan RPM to design requirements, record initial and final readings.
- H. Test and record motor amps, initial and final readings.
- I. Make pitot tube traverse readings of main ducts and obtain design CFM for supply, return and outside air systems by adjusting fans and dampers.
- J. Test and record systems static pressures, suction and discharge; record initial and final readings.
- K. Test and adjust each terminal unit.
- L. Check and record inlet static pressures and modulation limit CFM values, initial and final readings after adjustments.
- M. The Balancing Contractor shall have a Controls Mechanic available at all times to assist the balancing personnel in adjusting control devices.
- N. Clearly mark the final position of all dampers, diffusers, reheat boxes, etc. with permanent identification material, neatly applied so as to be easily read and understood.
- O. Confusing or illegible markings shall be removed and reapplied as directed by the Project Manager.
- P. All mechanical HVAC systems, air and water, shown on the plans shall be tested and adjusted to design flow. If heating air flow values are different than cooling, provide certification that heating CFM values are within design.
- Q. Replace sheaves and drives where required to meet design conditions.
- R. Copies of a formal balance report shall be prepared and submitted for inclusion in the Operation and Maintenance Manuals. The report shall contain a

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

complete, legible schedule of:

1. All equipment outlets/inlets and their respective flows
2. Pitot tube traverse readings and associated calculations
3. Reheat box settings, GPM and CFM
4. Box static pressures at inlets
5. Box CFM limits (maximum and minimum)
6. Status of each pump and fan, including RPM, AMPS, suction and discharge static pressures, and flow rates.
7. A set of master plans shall be bound with the schedules (11" x 17" maximum) identifying the location of each inlet/outlet and device tested.
8. Calibration documents

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 1. Measure total airflow.
 - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
 2. Measure fan static pressures as follows to determine actual static pressure:
 - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
 - a. Report the cleanliness status of filters and the time static pressures are measured.
4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
 1. Measure airflow of submain and branch ducts.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure air outlets and inlets without making adjustments.
 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.7 PROCEDURES FOR DUAL-DUCT SYSTEMS

- A. Verify that the cooling coil is capable of full-system airflow, and set mixing boxes at full-cold airflow position for fan volume.
- B. Measure static pressure in both hot and cold ducts at the end of the longest duct run to determine that sufficient static pressure exists to operate controls of mixing boxes and to overcome resistance in the ducts and outlets downstream from mixing boxes.
 - 1. If insufficient static pressure exists, increase airflow at the fan.
- C. Test and adjust the constant-volume mixing boxes as follows:
 - 1. Verify both hot and cold operations by adjusting the thermostat and observing changes in air temperature and volume.
 - 2. Verify sufficient inlet static pressure before making volume adjustments.
 - 3. Adjust mixing boxes to indicated airflows within specified tolerances. Measure airflow by Pitot-tube traverse readings or by measuring static pressure at mixing-box taps if provided by mixing-box manufacturer.
- D. Do not overpressurize ducts.
- E. Remeasure static pressure in both hot and cold ducts at the end of the longest duct run to determine that sufficient static pressure exists to operate controls of mixing boxes and to overcome resistance in the ducts and outlets downstream from mixing boxes.
- F. Adjust variable-air-volume, dual-duct systems in the same way as constant-volume, dual-duct systems; adjust maximum- and minimum-airflow setting of each mixing box.

3.8 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

- A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.
- B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
 - 1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
 - 2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
 - 3. Measure total system airflow. Adjust to within indicated airflow.
 - 4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.
 - a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.
6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
 - a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.
7. Measure static pressure at the most critical terminal unit and adjust the maximum static-pressure set point at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit. Notify engineer if pressure is above the allowable range before making the adjustment.
8. Record final fan-performance data.

3.9 PROCEDURES FOR HYDRONIC SYSTEMS.

- A. Command all systems into full cooling or heating mode (Valves may not be 100% open). Pumps VFCs shall modulate in automatic control to meet the static pressure set point. When pump speed is stable take measurements.
 1. Balance circuit setters for the end of line three-way valves to design flow.
 2. Measure and record water flows at each air handler coil.
 3. Measure flow of each pump.

3.10 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 1. Manufacturer's name, model number, and serial number.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Efficiency rating.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.11 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

- A. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. New filters are installed.
 2. Coils are clean and fins combed.
 3. Drain pans are clean.
 4. Fans are clean.
 5. Bearings and other parts are properly lubricated.
 6. Deficiencies noted in the preconstruction report are corrected.
- B. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
 2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
 3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
 4. Balance each air outlet.

3.12 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING HYDRONIC SYSTEMS.

- A. Balancing procedures shall ensure that balancing valves are open as much as possible to minimize system pressure drop
- B. Constant speed primary boiler pumps.
1. Set flow rate to rated GPM.
- C. Variable speed secondary hot water and chilled water systems.
1. All two way valves are pressure-independent self-flow regulating valves which are not manually balanced.
 2. With controls contractor, set systems into automatic control with the VFCs regulating system pressure to maintain the static pressure set point. Close enough two-way control valves closer to the pumps so the system flow rate is approximately 50% of design. All other valves shall be 100% open.
 - a. Balance flow rates through coils with 3-way valves. Adjust BAS DP set point lower if required so at least one of the balancing valves is 100% open.
 - b. Verify that the system DP set point is adequate to provide rated flow through a small sample of the 2-way valves.
 3. Chilled water system:
 - a. With the two-way valve closed and the three-way chilled water valves 100% open;
 - 1) Balance the flows through the three coils served by three-way valves. (One balancing valve shall be 100% open).
 - 2) Determine the minimum pump speed required to maintain the minimum chiller evaporator flow rate. Contractor shall program the

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

minimum pump speed in the VFC at 10% above this flow rate.

- b. With the chilled water pump at minimum speed, change the three-way valves to the closed position and verify that the system flow rate is the same or greater than when the control valves are in the open position.

3.13 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 5 percent.
 2. Air Outlets and Inlets: Plus or minus 5 percent.
 3. Heating-Water Flow Rate: Plus or minus 5 percent.
 4. Cooling-Water Flow Rate: Plus or minus 5 percent.

3.14 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 1. Pump curves.
 2. Fan curves.
 3. Manufacturers' test data.
 4. Field test reports prepared by system and equipment installers.
 5. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 1. Title page.
 2. Name and address of the TAB contractor.
 3. Project name.
 4. Project location.
 5. Engineer's name and address.
 6. Contractor's name and address.
 7. Report date.
 8. Signature of TAB supervisor who certifies the report.
 9. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 10. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- c. Description of system operation sequence if it varies from the Contract Documents.
11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer's name, type, size, and fittings.
13. Notes to explain why certain final data in the body of reports vary from indicated values.
14. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
 1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Water and steam flow rates.
 3. Duct, outlet, and inlet sizes.
 4. Pipe and valve sizes and locations.
 5. Terminal units.
 6. Balancing stations.
 7. Position of balancing devices.
- E. Air-Terminal-Device Reports:
 1. Unit Data:
 - a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Apparatus used for test.
 - d. Area served.
 - e. Make.
 - f. Number from system diagram.
 - g. Type and model number.
 - h. Size.
 - i. Effective area in sq. ft.
 2. Test Data (Indicated and Actual Values):
 - a. Air flow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary air flow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final air flow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

F. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:
 - a. System and air-handling-unit identification.
 - b. Location and zone.
 - c. Room or riser served.
 - d. Coil make and size.
 - e. Flowmeter type.
2. Test Data (Indicated and Actual Values):
 - a. Air flow rate in cfm.
 - b. Entering-water temperature in deg F.
 - c. Leaving-water temperature in deg F.
 - d. Water pressure drop in feet of head or psig.
 - e. Entering-air temperature in deg F.
 - f. Leaving-air temperature in deg F.

G. Instrument Calibration Reports:

1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.15 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:
 - a. Measure airflow of at least 10 percent of air outlets.
 - b. Measure water flow of at least 10 percent of terminals.
 - c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
 - d. Verify that balancing devices are marked with final balance position.
 - e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Engineer.
2. The TAB contractor's test and balance engineer shall conduct the inspection

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- in the presence of Owner.
3. Engineer shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
 4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
 5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:
1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.
- D. Prepare test and inspection reports.

3.16 ADDITIONAL TESTS

- A. The Test and Balance Contractor shall include an extended warranty of 90 days after the completion of the project, during which time the Owner may request a recheck or re-set of any outlet, inlet, control, or mechanical unit.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

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 insulating the following duct services:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, exposed supply and outdoor air.
 - 3. Outdoor, concealed supply and return.
 - 4. Outdoor, exposed supply and return.
- B. Related Sections:
 - 1. Section 230719 "HVAC Piping Insulation."
 - 2. Section 233113 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
 - 1. For adhesives and sealants, documentation including printed statement of VOC content.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Provide fiberglass faced duct wrap Type IV with factory applied flame retardant foil reinforced Kraft facing FRK-25, U.L. Label.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.](#)
 - b. [Eagle Bridges - Marathon Industries; 225.](#)
 - c. [Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.Mon-Eco Industries, Inc.; 22-25.](#)
 - 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.](#)
 - b. [Vimasco Corporation; 749.](#)
 - 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 5. Color: White.

2.4 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.5 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [ABI, Ideal Tape Division; 428 AWF ASJ.](#)
 - b. [Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.](#)
 - c. [Compac Corporation; 104 and 105.](#)
 - d. [Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.](#)
 - 2. Width: 3 inches.
 - 3. Thickness: 11.5 mils.
 - 4. Adhesion: 90 ounces force/inch in width.
 - 5. Elongation: 2 percent.
 - 6. Tensile Strength: 40 lbf/inch in width.
 - 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [ABI](#), Ideal Tape Division; 488 AWF.
 - b. [Avery Dennison Corporation](#), Specialty Tapes Division; Fasson 0800.
 - c. [Compac Corporation](#); 120.
 - d. [Venture Tape](#); 3520 CW.
 - 2. Width: 2 inches.
 - 3. Thickness: 3.7 mils.
 - 4. Adhesion: 100 ounces force/inch in width.
 - 5. Elongation: 5 percent.
 - 6. Tensile Strength: 34 lbf/inch in width.

2.6 SECUREMENTS

- A. Bands:
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [ITW Insulation Systems](#); Gerrard Strapping and Seals.
 - b. [RPR Products, Inc.](#); Insul-Mate Strapping, Seals, and Springs.
 - 2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing seal or closed seal.
 - 3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.
 - 4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.
- B. Insulation Pins and Hangers:
 - 1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated.
 - a. **Products:** Subject to compliance with requirements, provide one of the following:
 - 1) [AGM Industries, Inc.](#); CWP-1.
 - 2) [GEMCO](#); CD.
 - 3) [Midwest Fasteners, Inc.](#); CD.
 - 4) [Nelson Stud Welding](#); TPA, TPC, and TPS.
 - 2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 - a. **Products:** Subject to compliance with requirements, provide one of the following:
 - 1) [AGM Industries, Inc.](#); CHP-1.
 - 2) [GEMCO](#); Cupped Head Weld Pin.
 - 3) [Midwest Fasteners, Inc.](#); Cupped Head.
 - 4) [Nelson Stud Welding](#); CHP.
 - 3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. **Products:** Subject to compliance with requirements, provide one of the following:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 1) [AGM Industries, Inc.](#); Tactoo Perforated Base Insul-Hangers.
 - 2) [GEMCO](#); Perforated Base.
 - 3) [Midwest Fasteners, Inc.](#); Spindle.
- b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
- c. Spindle: Copper- or zinc-coated, low-carbon steel, aluminum, or stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
- d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
- a. **Products:** Subject to compliance with requirements, provide one of the following:
 - 1) [GEMCO](#); Nylon Hangers.
 - 2) [Midwest Fasteners, Inc.](#); Nylon Insulation Hangers.
 - b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
 - c. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
 - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
- a. **Products:** Subject to compliance with requirements, provide one of the following:
 - 1) [AGM Industries, Inc.](#); Tactoo Self-Adhering Insul-Hangers.
 - 2) [GEMCO](#); Peel & Press.
 - 3) [Midwest Fasteners, Inc.](#); Self Stick.
 - b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - c. Spindle: Copper- or zinc-coated, low-carbon steel, aluminum, or stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
 - d. Adhesive-backed base with a peel-off protective cover.
6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel, aluminum, or stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- a. **Products:** Subject to compliance with requirements, provide one of the following:
 - 1) [AGM Industries, Inc.](#); RC-150.
 - 2) [GEMCO](#); R-150.
 - 3) [Midwest Fasteners, Inc.](#); WA-150.
 - 4) [Nelson Stud Welding](#); Speed Clips.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- 7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - 1) **GEMCO.**
 - 2) **Midwest Fasteners, Inc.**
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- D. Wire: 0.062-inch soft-annealed, stainless steel.
 - 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. **C & F Wire.**

2.7 CORNER ANGLES

- A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.
- C. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Duct insulation wrap in exposed corridors shall be canvas covered and painted to match existing duct insulation.
- B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- E. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- F. Install multiple layers of insulation with longitudinal and end seams staggered.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c. Adhere insulation with 4" strips of Insulation Bonding Adhesive at 8" on center.
 - 3. Overlap jacket longitudinal seams at least 2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c. Adhere insulation with 4" strips of Insulation Bonding Adhesive at 8" on center. Cover longitudinal joints with 3-inch wide strips, of same material as insulation jacket.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 - 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- E. Insulation Installation at Floor Penetrations:
 - 1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 - 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 - 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.7 FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
 1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
 3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where FSK jackets are indicated, install as follows:
 1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.8 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

3.9 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, supply, return and outdoor air.
- B. Items Not Insulated:
 - 1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 - 2. Factory-insulated flexible ducts.
 - 3. Flexible connectors.
 - 4. Vibration-control devices.
 - 5. Factory-insulated access panels and doors.

3.12 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round, rectangular, and flat-oval, supply-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3.13 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.
- B. Concealed, round, rectangular, and flat-oval, supply and return-air duct insulation shall be R-12 and shall be one of the following:
 - 1. Mineral-Fiber Blanket: 3 inches and 3-lb/cu. ft. nominal density.
 - 2. Mineral-Fiber Board: 3 inches thick and 3-lb/cu. ft. nominal density.

3.14 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Ducts and Plenums, Exposed:
 - 1. Aluminum, Corrugated: 0.040 inch thick with a Polyfilm Moisture Barrier (PFMB) coating.

END OF SECTION 230713

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following HVAC piping systems:
 - 1. Chilled-water and brine piping, indoors and outdoors.
 - 2. Heating hot-water piping, indoors and outdoors.
 - 3. Refrigerant suction and hot-gas piping, indoors and outdoors.
 - 4. Dual-service heating and cooling piping, indoors and outdoors.

- B. Related Sections:
 - 1. Section 230713 "Duct Insulation."
 - 2. Section 230716 "HVAC Equipment Insulation."
 - 3. Section 232113.13 "Underground Hydronic Piping" for loose-fill pipe insulation in underground piping outside the building.
 - 4. Section 336313 "Underground Steam and Condensate Distribution Piping" for loose-fill pipe insulation in underground piping outside the building.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail attachment and covering of heat tracing inside insulation.
 - 3. Detail insulation application at pipe expansion joints for each type of insulation.
 - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 5. Detail removable insulation at piping specialties.
 - 6. Detail application of field-applied jackets.
 - 7. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- E. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Block Insulation: ASTM C 552, Type I.
 - 2. Special-Shaped Insulation: ASTM C 552, Type III.
 - 3. Board Insulation: ASTM C 552, Type IV.
 - 4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 - 5. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
 - 6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
- G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 1290, Type I.
- H. Mineral-Fiber, Preformed Pipe Insulation:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 2. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- I. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory-applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.
 - J. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.
 1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. PVC Jacket Adhesive: Compatible with PVC jacket.
 - 1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 4. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: 60 percent by volume and 66 percent by weight.
 - 4. Color: White.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.5 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. PVDC Jacket for Indoor Applications: 4-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
6. PVDC Jacket for Outdoor Applications: 6-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.
7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.
8. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil face, fiberglass-reinforced scrim with kraft-paper backing.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 1. Adhesive: As recommended by jacket material manufacturer.
 2. Color: Color-code jackets based on system. Color as selected by Architect.
 3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- D. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 1. Sheet and roll stock ready for shop or field sizing.
 2. Finish and thickness are indicated in field-applied jacket schedules.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. Moisture Barrier for Indoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
4. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
5. Factory-Fabricated Fitting Covers:
 - a. Same material, finish, and thickness as jacket.
 - b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - c. Tee covers.
 - d. Flange and union covers.
 - e. End caps.
 - f. Beveled collars.
 - g. Valve covers.
 - h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- E. Self-Adhesive Outdoor Jacket: 60-mil-thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with white aluminum-foil facing.
- F. PVDC Jacket for Indoor Applications: 4-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
- G. PVDC Jacket for Outdoor Applications: 6-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.
- H. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 1. Width: 3 inches.
 2. Thickness: 11.5 mils.
 3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 1. Width: 3 inches.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Thickness: 6.5 mils.
 3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Width: 2 inches.
 2. Thickness: 6 mils.
 3. Adhesion: 64 ounces force/inch in width.
 4. Elongation: 500 percent.
 5. Tensile Strength: 18 lbf/inch in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Width: 2 inches.
 2. Thickness: 3.7 mils.
 3. Adhesion: 100 ounces force/inch in width.
 4. Elongation: 5 percent.
 5. Tensile Strength: 34 lbf/inch in width.
- E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.
1. Width: 3 inches.
 2. Film Thickness: 4 mils.
 3. Adhesive Thickness: 1.5 mils.
 4. Elongation at Break: 145 percent.
 5. Tensile Strength: 55 lbf/inch in width.
- F. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.
1. Width: 3 inches.
 2. Film Thickness: 6 mils.
 3. Adhesive Thickness: 1.5 mils.
 4. Elongation at Break: 145 percent.
 5. Tensile Strength: 55 lbf/inch in width.

2.10 SECUREMENTS

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- C. Wire: 0.080-inch nickel-copper alloy.

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at **[2 inches] [4 inches]** o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Manholes.
 5. Handholes.
 6. Cleanouts.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange

- cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
 1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of polyolefin pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
 2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 FIELD-APPLIED JACKET INSTALLATION

- A. Where FSK jackets are indicated, install as follows:
1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.
- D. Where PVDC jackets are indicated, install as follows:
1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
 2. Wrap factory-presizes jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
3. Continuous jacket can be spiral-wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
 4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch-circumference limit allows for 2-inch-overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
 5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.10 FINISHES

- A. Pipe Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

- A. Chilled Water and Brine, above 40 Deg F: Insulation shall be the following:
 - 1. Cellular Glass: 1-1/2 inches thick.
- B. Heating-Hot-Water Supply and Return, 200 Deg F and Below: Insulation shall be one of the following:
 - 1. Cellular Glass: 2-1/2 inches thick.
 - 2. Mineral-Fiber, Preformed Pipe, Type I: 2 inch thick.
- C. Refrigerant Suction and Hot-Gas Piping: Flexible elastomeric, 1 inch thick.
- D. Refrigerant Suction and Hot-Gas Flexible Tubing: Flexible elastomeric, 1 inch thick.
- E. Dual-Service Heating and Cooling, 40 to 200 Deg F: Insulation shall be one of the following:
 - 1. Cellular Glass: 2-1/2 inches thick.
 - 2. Mineral-Fiber, Preformed Pipe, Type I: 2inch thick.

3.14 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Chilled Water and Brine: Insulation shall be one of the following:
 - 1. Cellular Glass: 3 inches thick.
 - 2. Flexible Elastomeric: 3 inches thick.
 - 3. Mineral-Fiber, Preformed Pipe Insulation, Type I: 3 inches thick.
 - 4. Polyolefin: 3 inches thick.
- B. Heating-Hot-Water Supply and Return, 200 Deg F and Below: Insulation shall be one of the following:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Cellular Glass: 3 inches thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

C. Refrigerant Suction and Hot-Gas Piping: Insulation shall be one of the following:

1. Cellular Glass: 2 inches thick.
2. Flexible Elastomeric: 2 inches thick.
3. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.
4. Polyolefin: 2 inches thick.

D. Refrigerant Suction and Hot-Gas Flexible Tubing: Insulation shall be one of the following:

1. Flexible Elastomeric: 2 inches thick.
2. Polyolefin: 2 inches thick.

E. Dual-Service Heating and Cooling: Insulation shall be one of the following:

1. Cellular Glass: 3 inches thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3.15 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

- A. Loose-fill insulation, for belowground piping, is specified in Section 232113.13 "Underground Hydronic Piping" and Section 336313 "Underground Steam and Condensate Distribution Piping."
- B. Chilled Water, All Sizes: Cellular glass, 2 inches thick.
- C. Heating-Hot-Water Supply and Return, All Sizes, 200 Deg F and Below: Cellular glass, 3 inches thick.
- D. Dual-Service Heating and Cooling, All Sizes, 40 to 200 Deg F: Cellular glass, 3 inches thick.

3.16 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 1. PVC: 20 mils thick.
- D. Piping, Exposed:
 1. PVC: 20 mils thick.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3.17 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 - 1. Aluminum, Smooth: 0.024 inch thick.
- D. Piping, Exposed:
 - 1. Aluminum, Smooth: 0.024 inch thick.

3.18 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

- A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 230719

SECTION 230923.11 - CONTROL VALVES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes control valves and actuators for DDC systems.
- B. Related Requirements:
 - 1. Section 230923 "Direct-Digital Control System for HVAC" control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.
 - 2. Section 230933 "Electric and Electronic Control System for HVAC" for electric/electronic control valves and actuators in electric and electronic control systems.
 - 3. Section 230943 "Pneumatic Control System for HVAC" for pneumatic control valves and actuators in pneumatic control systems.
 - 4. Section 230993 "Sequence of Operations for HVAC Controls" for requirements that relate to Section 230923.11.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include diagrams for power, signal, and control wiring.
 - 2. Include diagrams for pneumatic signal and main air tubing.
- C. Delegated-Design Submittal:
 - 1. Schedule and design calculations for control valves and actuators, including the following:
 - a. Flow at project design and minimum flow conditions.
 - b. Pressure differential drop across valve at project design flow condition.
 - c. Maximum system pressure differential drop (pump close-off pressure) across valve at project minimum flow condition.
 - d. Design and minimum control valve coefficient with corresponding valve position.
 - e. Maximum close-off pressure.
 - f. Leakage flow at maximum system pressure differential.
 - g. Torque required at worst case condition for sizing actuator.
 - h. Actuator selection indicating torque provided.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 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. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.
- C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to size products where indicated as delegated design.
- D. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.
- E. Determine control valve sizes and flow coefficients by ISA 75.01.01.
- F. Control valve characteristics and rangeability shall comply with ISA 75.11.01.
- G. Selection Criteria:
 - 1. Control valves shall be suitable for operation at following conditions:
 - a. 50 psi and 200 F.
 - 2. Fail positions unless otherwise indicated:
 - a. Chilled Water: Open.
 - b. Condenser Water: Open.
 - c. Heat Recovery: Close.
 - d. Heating Hot Water: Open.
 - 3. Minimum Cv shall be calculated at 10 percent of design flow, with a coincident pressure differential equal to the system design pump head.
 - 4. In water systems, select modulating control valves at terminal equipment for a design Cv based on a pressure drop of 5 psig at design flow unless otherwise indicated.

2.2 BALL-STYLE CONTROL VALVES

- A. Ball Valves with Single Port and Characterized Disk:
 - 1. Pressure Rating for NPS 1 and Smaller: Nominal 600 WOG.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Pressure Rating for NPS 1-1/2 through NPS 2: Nominal 400 WOG.
3. Close-off Pressure: 200 psig.
4. Process Temperature Range: Zero to 212 deg F.
5. Body and Tail Piece: Cast bronze ASTM B 61, ASTM B 62, ASTM B 584, or forged brass with nickel plating.
6. End Connections: Threaded (NPT) ends.
7. Ball: Chrome-plated brass or bronze or 300 series stainless steel.
8. Stem and Stem Extension:
 - a. Material to match ball.
 - b. Blowout-proof design.
 - c. Sleeve or other approved means to allow valve to be opened and closed without damaging the insulation or the vapor barrier seal.
9. Ball Seats: Reinforced PTFE.
10. Stem Seal: Reinforced PTFE packing ring with a threaded packing ring follower to retain the packing ring under design pressure with the linkage removed. Alternative means, such as EPDM O-rings, are acceptable if an equivalent cycle endurance can be demonstrated by testing.
11. Flow Characteristic: Equal percentage.

B. Ball Valves with Two Ports and Characterized Disk:

1. Pressure Rating for NPS 1 and Smaller: Nominal 600 WOG.
2. Pressure Rating for NPS 1-1/2 through NPS 2: Nominal 400 WOG.
3. Close-off Pressure: 200 psig.
4. Process Temperature Range: Zero to 212 deg F.
5. Body and Tail Piece: Cast bronze ASTM B 61, ASTM B 62, ASTM B 584, or forged brass with nickel plating.
6. End Connections: Threaded (NPT) ends.
7. Ball: Chrome-plated brass or bronze or 300 series stainless steel.
8. Stem and Stem Extension:
 - a. Material to match ball.
 - b. Blowout-proof design.
 - c. Sleeve or other approved means to allow valve to be opened and closed without damaging the insulation or the vapor barrier seal.
9. Ball Seats: Reinforced PTFE.
10. Stem Seal: Reinforced PTFE packing ring with a threaded packing ring follower to retain the packing ring under design pressure with the linkage removed. Alternative means, such as EPDM O-rings, are acceptable if an equivalent cycle endurance can be demonstrated by testing.
11. Flow Characteristics for A-Port: Equal percentage.
12. Flow Characteristics for B-Port: Modified for constant common port flow.

C. Pressure-Independent Ball Valves NPS 2 and Smaller:

1. Performance:
 - a. Pressure Rating: 600 psig for NPS 1 and 400 psig for NPS 1-1/2 and NPS 2.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- b. Close-off pressure of 200 psig.
 - c. Process Temperature Range: Between zero to 212 deg F.
 - d. Rangeability: 100 to 1.
 - e. Valve Authority: 100%
2. Integral Pressure Regulator: Located upstream of ball to regulate pressure, to maintain a constant pressure differential while operating within a pressure differential range of 5 to 50 psig.
 3. Body: Forged brass, nickel plated, and with threaded ends.
 4. Ball: Chrome-plated brass.
 5. Stem and Stem Extension: Chrome-plated brass, blowout-proof design.
 6. Stem sleeve or other approved means to allow valve to be opened and closed without damaging field-applied insulation and insulation vapor barrier seal.
 7. Ball Seats: Reinforced PTFE.
 8. Stem Seal: Reinforced PTFE packing ring stem seal with threaded packing ring follower to retain the packing ring under design pressure with the linkage removed. Alternative means, such as EPDM O-rings, are acceptable if equivalent cycle endurance can be achieved.
 9. Flow Characteristic: Equal percentage.

2.3 BUTTERFLY-STYLE CONTROL VALVES

A. Commercial-Grade, Two-Way Butterfly Valves:

1. Performance:
 - a. Bi-directional bubble tight shutoff at 250 psig.
 - b. Comply with MSS SP-67 or MSS SP-68.
 - c. Rotation: Zero to 90 degrees.
 - d. Linear or modified equal percentage flow characteristic.
2. Body: Cast iron ASTM A 126, Class B, ductile iron ASTM A 536 or cast steel ASTM A 216/A 216M WCB fully lugged, suitable for mating to ASME B16.5 flanges.
3. Disc: 316 stainless steel.
4. Shaft: 316 or 17-4 PH stainless steel.
5. Seat: Reinforced EPDM or reinforced PTFE with retaining ring.
6. Shaft Bushings: Reinforced PTFE or stainless steel.
7. Replaceable seat, disc, and shaft bushings.
8. Corrosion-resistant nameplate indicating:
 - a. Manufacturer's name, model number, and serial number.
 - b. Body size.
 - c. Body and trim materials.
 - d. Flow arrow.

B. Commercial-Grade, Three-Way Butterfly Valves:

1. Arrangement: Two valves mated to a fabricated tee with interconnecting mechanical linkage.
2. Performance:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Bi-directional bubble tight shutoff at 250 psig.
 - b. Comply with MSS SP-67 or MSS SP-68.
 - c. Rotation: Zero to 90 degrees.
 - d. Linear or modified equal percentage flow characteristic.
3. Body: Cast iron ASTM A 126, Class B, ductile iron ASTM A 536 or cast steel ASTM A 216/A 216M WCB fully lugged, suitable for mating to ASME B16.5 flanges.
 4. Disc: 316 stainless steel.
 5. Shaft: 316 or 17-4 PH stainless steel.
 6. Seat: Reinforced EPDM or reinforced PTFE seat with retaining ring.
 7. Shaft Bushings: Reinforced PTFE or stainless steel.
 8. Replaceable seat, disc, and shaft bushings.
 9. Corrosion-resistant nameplate indicating:
 - a. Manufacturer's name, model number, and serial number.
 - b. Body size.
 - c. Body and trim materials.
 - d. Flow arrow.

2.4 GLOBE-STYLE CONTROL VALVES

A. General Globe-Style Valve Requirements:

1. Globe-style control valve body dimensions shall comply with ISA 75.08.01.
2. Construct the valves to be serviceable from the top.
3. For cage guided valves, trim shall be field interchangeable for different valve flow characteristics, such as equal percentage, linear, and quick opening.
4. Reduced trim for one nominal size smaller shall be available for industrial valves NPS 1 and larger.
5. Replaceable seats and plugs.
6. Furnish each control valve with a corrosion-resistant nameplate indicating the following:
 - a. Manufacturer's name, model number, and serial number.
 - b. Body and trim size.
 - c. Arrow indicating direction of flow.

B. Two-Way Globe Valves NPS 2 and Smaller:

1. Globe Style: Single port.
2. Body: Cast bronze or forged brass with ASME B16.5, Class 250 rating.
3. End Connections: Threaded.
4. Bonnet: Screwed.
5. Packing: PTFE V-ring.
6. Plug: Top guided.
7. Plug, Seat, and Stem: Brass or stainless steel.
8. Process Temperature Range: 35 to 248 deg F.
9. Ambient Operating Temperature: 35 to 150 deg F.
10. Leakage: FCI 70-2, Class IV.
11. Rangeability: 25 to 1.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

12. Equal percentage flow characteristic.

C. Three-Way Globe Valves NPS 2 and Smaller:

1. Globe Style: Mix flow pattern.
2. Body: Cast bronze or forged brass with ASME B16.5, Class 250 rating.
3. End Connections: Threaded.
4. Bonnet: Screwed.
5. Packing: PTFE V-ring.
6. Plug: Top guided.
7. Plug, Seat, and Stem: Brass or stainless steel.
8. Process Temperature Range: 35 to 248 deg F.
9. Ambient Operating Temperature: 35 to 150 deg F.
10. Leakage: FCI 70-2, Class IV.
11. Rangeability: 25 to 1.
12. Linear flow characteristic.

D. Two-Way Globe Valves NPS 2-1/2 to NPS 6:

1. Globe Style: Single port.
2. Body: Cast iron complying with ASME B61.1, Class 125.
3. End Connections: Flanged, suitable for mating to ASME B16.5, Class 150 flanges.
4. Bonnet: Bolted.
5. Packing: PTFE cone-ring.
6. Plug: Top or bottom guided.
7. Plug, Seat, and Stem: Brass or stainless steel.
8. Process Temperature Rating: 35 to 281 deg F.
9. Leakage: 0.1 percent of maximum flow.
10. Rangeability: Varies with valve size between 6 and 10 to 1.
11. Modified linear flow characteristic.

E. Industrial-Grade Straight-Through Globe Valves NPS 1 and Larger:

1. Globe Style: Single port.
2. Body: Cast iron or cast steel.
3. End Connections for NPS 2: Threaded.
4. End Connections for NPS 2-1/2 and Larger: Raised face flanged.
5. Bonnet: Bolted.
6. Packing: PTFE V-ring.
7. Plug: Cage guided and unbalanced.
8. Plug, Seat, and Stem: 416 stainless-steel plug and seat, 17-4 PH stainless-steel cage and 316 stainless-steel stem.
9. Valve Stem: Thread and pin stem to plug.
10. Valve Stem Finish: Polished to 5 microinches rms or less.
11. Plug and Seat Surfaces: Hardened facing.
12. Process Temperature Range: Zero to 450 deg F.
13. Ambient Operating Temperature: Minus 20 to plus 150 deg F.
14. Leakage: FCI 70-2, Class V.
15. Flow Characteristic: Linear.

2.5 SOLENOID VALVES

- A. Description:
 - 1. Action: Either normally open or normally closed in the event of electrical power failure as required by the application.
 - 2. Size to close against the system pressure.
 - 3. Manual override capable.
 - 4. Heavy-duty assembly.
 - 5. Body: Brass or stainless steel.
 - 6. Seats and Discs: NBR or PTFE.
 - 7. Solenoid Enclosure: NEMA 250, Type 4.

2.6 ELECTRIC AND ELECTRONIC CONTROL VALVE ACTUATORS

- A. Actuators for Hydronic Control Valves: Capable of closing valve against system pump shutoff head.
- B. Actuators for Steam Control Valves: Shutoff against 1.5 times steam design pressure.
- C. Position indicator and graduated scale on each actuator.
- D. Type: Motor operated, with or without gears, electric and electronic.
- E. Voltage: 24-V ac.
- F. Deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.
- G. Function properly within a range of 85 to 120 percent of nameplate voltage.
- H. Construction:
 - 1. For Actuators Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
 - 2. For Actuators from 100 to 400 W: Gears ground steel, oil immersed, shaft hardened steel running in bronze, copper alloy or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel or cast-aluminum housing.
 - 3. For Actuators Larger Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.
- I. Field Adjustment:
 - 1. Spring Return Actuators: Easily switchable from fail open to fail closed in the field without replacement.
 - 2. Gear Type Actuators: External manual adjustment mechanism to allow manual positioning when the actuator is not powered.
- J. Two-Position Actuators: Single direction, spring return or reversing type.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

K. Modulating Actuators:

1. Operation: Capable of stopping at all points across full range, and starting in either direction from any point in range.
2. Control Input Signal:
 - a. Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs. One input drives actuator to open position and other input drives actuator to close position. No signal of either input remains in last position.
 - b. Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for V dc 4- to 20-mA signals.
 - c. Pulse Width Modulation (PWM): Actuator drives to a specified position according to pulse duration (length) of signal from a dry contact closure, triac sink, or source controller.
 - d. Programmable Multi-Function:
 - 1) Control Input, Position Feedback, and Running Time: Factory or field programmable.
 - 2) Diagnostic: Feedback of hunting or oscillation, mechanical overload, mechanical travel, and mechanical load limit.
 - 3) Service Data: Include, at a minimum, number of hours powered and number of hours in motion.

L. Position Feedback:

1. Equip two-position actuators with limits switches or other positive means of a position indication signal for remote monitoring of open and close position.
2. Equip modulating actuators with a position feedback through current or voltage signal for remote monitoring.
3. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.

M. Fail-Safe:

1. Where indicated, provide actuator to fail to an end position.
2. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.
3. Batteries, capacitors, and other non-mechanical forms of fail-safe operation are acceptable only where uniquely indicated.

N. Integral Overload Protection:

1. Provide against overload throughout the entire operating range in both directions.
2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

O. Valve Attachment:

1. Unless otherwise required for valve interface, provide an actuator designed to be directly coupled to valve shaft without the need for connecting linkages.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Attach actuator to valve drive shaft in a way that ensures maximum transfer of power and torque without slippage.
3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.

P. Temperature and Humidity:

1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.
2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

Q. Enclosure:

1. Suitable for ambient conditions encountered by application.
2. NEMA 250, Type 2 for indoor and protected applications.
3. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.
4. Provide actuator enclosure with heater and control where required by application.

R. Stroke Time:

1. Operate valve from fully closed to fully open within 60 seconds.
2. Operate valve from fully open to fully closed within 60 seconds.
3. Move valve to failed position within 15 seconds.
4. Select operating speed to be compatible with equipment and system operation.

S. Sound:

1. Spring Return: 62 dBA.
2. Non-Spring Return: 45 dBA.

PART 3 - EXECUTION

3.1 CONTROL VALVE APPLICATIONS

A. Control Valves:

1. Select from valves specified in "Control Valves" Article to achieve performance requirements and characteristics indicated while subjected to full range of system operation encountered.
2. General System,, Two-Way Applications Controlled by Flow: Ball valves with single port and characterized disk.

3.2 INSTALLATION, GENERAL

- A. Furnish and install products required to satisfy most stringent requirements indicated.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Install products level, plumb, parallel, and perpendicular with building construction.
- C. Properly support instruments, tubing, piping, wiring, and conduits to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a force.
- D. Provide ceiling, floor, roof, and wall openings and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.
- E. Firestop penetrations made in fire-rated assemblies and seal penetrations made in acoustically rated assemblies.
- F. Fastening Hardware:
 - 1. Stillson wrenches, pliers, and other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
 - 2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
 - 3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.
- G. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.
- H. Corrosive Environments:
 - 1. Use products that are suitable for environment to which they will be subjected.
 - 2. If possible, avoid or limit use of materials in corrosive environments, including, but not limited to, the following:
 - a. Laboratory exhaust airstreams.
 - b. Process exhaust airstreams.
 - 3. Use Type 316 stainless-steel tubing and fittings when in contact with a corrosive environment.
 - 4. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
 - 5. Where control devices are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.3 ELECTRIC POWER

- A. Furnish and install electrical power to products requiring electrical connections.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."
- C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.4 CONTROL VALVES

- A. Install pipe reducers for valves smaller than line size. Position reducers as close to valve as possible but at distance to avoid interference and impact to performance. Install with manufacturer-recommended clearance.
- B. Install flanges or unions to allow drop-in and -out valve installation.
- C. Where indicated, install control valve with three-valve bypass manifold to allow for control valve isolation and removal without interrupting system flow by providing manual throttling valve in bypass pipe.
- D. Install drain valves in piping upstream and downstream of each control valve installed in a three-valve manifold and for each control valve larger than NPS 2.
- E. Install pressure temperature taps in piping upstream and downstream of each control valve larger than NPS 1.
- F. Valve Orientation:
 - 1. Where possible, install globe and ball valves installed in horizontal piping with stems upright and not more than 15 degrees off of vertical, not inverted.
 - 2. Install valves in a position to allow full stem movement.
 - 3. Where possible, install butterfly valves that are installed in horizontal piping with stems in horizontal position and with low point of disc opening with direction of flow.
- G. Clearance:
 - 1. Locate valves for easy access and provide separate support of valves that cannot be handled by service personnel without hoisting mechanism.
 - 2. Install valves with at least 12 inches of clear space around valve and between valves and adjacent surfaces.
- H. Threaded Valves:
 - 1. Note internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.
 - 2. Align threads at point of assembly.
 - 3. Apply thread compound to external pipe threads, except where dry seal threading is specified.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

4. Assemble joint, wrench tight. Apply wrench on valve end as pipe is being threaded.

I. Flanged Valves:

1. Align flange surfaces parallel.
2. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

J. Connect electrical devices and components to electrical grounding system. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

K. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

L. Install engraved phenolic nameplate with valve identification on valve.

3.5 CHECKOUT PROCEDURES

A. Control Valve Checkout:

1. Check installed products before continuity tests, leak tests, and calibration.
2. Check valves for proper location and accessibility.
3. Check valves for proper installation for direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.
4. For pneumatic products, verify air supply for each product is properly installed.
5. For pneumatic valves, verify that pressure gauges are provided in each air line to valve actuator and positioner.
6. Verify that control valves are installed correctly for flow direction.
7. Verify that valve body attachment is properly secured and sealed.
8. Verify that valve actuator and linkage attachment are secure.
9. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
10. Verify that valve ball, disc, and plug travel are unobstructed.
11. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace the valve if leaks persist.

3.6 ADJUSTMENT, CALIBRATION, AND TESTING

- A. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.
- B. Stroke control valves with pilot positioners. Adjust valve and positioner following manufacturer's recommended procedure, so valve is 100 percent closed, 50 percent closed, and 100 percent open at proper air pressures.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Check and document open and close cycle times for applications with a cycle time of less than 30 seconds.

- D. For control valves equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

END OF SECTION 230923.11

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes pipe and fitting materials and joining methods for the following:

1. Hot-water heating piping.
2. Chilled-water piping.
3. Condenser-water piping.
4. Makeup-water piping.
5. Condensate-drain piping.
6. Blowdown-drain piping.
7. Air-vent piping.
8. Safety-valve-inlet and -outlet piping.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Plastic pipe and fittings with solvent cement.
2. RTRP and RTRF with adhesive.
3. Pressure-seal fittings.
4. Chemical treatment.

B. Delegated-Design Submittal:

1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
2. Locations of pipe anchors and alignment guides and expansion joints and loops.
3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
4. Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
 - 1. 125 psig at 200 deg F.
 - 2. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
- B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.
- C. DWV Copper Tubing: ASTM B 306, Type DWV.
- D. Grooved, Mechanical-Joint, Wrought-Copper Fittings: ASME B16.22.
 - 1. Grooved-End Copper Fittings: ASTM B 75, copper tube or ASTM B 584, bronze casting.
 - 2. Grooved-End-Tube Couplings: Rigid pattern unless otherwise indicated; gasketed fitting. Ductile-iron housing with keys matching pipe and fitting grooves, EPDM gasket rated for minimum 230 deg F for use with housing, and steel bolts and nuts.
- E. Wrought-Copper Unions: ASME B16.22.

2.3 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.
- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in "Piping Applications" Article.
- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.
- F. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

G. Grooved Mechanical-Joint Fittings and Couplings:

1. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106/A 106M, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
2. Couplings: Ductile- or malleable-iron housing and **[EPDM]** **[or]** **[nitrile]** gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

2.4 PLASTIC PIPE AND FITTINGS

- A. CPVC Plastic Pipe: ASTM F 441/F 441M, with wall thickness as indicated in "Piping Applications" Article.
1. CPVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM F 438 for Schedule 40 pipe; ASTM F 439 for Schedule 80 pipe.
- B. PVC Plastic Pipe: ASTM D 1785, with wall thickness as indicated in "Piping Applications" Article.
1. PVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM D 2466 for Schedule 40 pipe; ASTM D 2467 for Schedule 80 pipe.

2.5 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- F. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

- G. Solvent Cements for Joining Plastic Piping:
 - 1. CPVC Piping: ASTM F 493.
 - a. CPVC solvent cement shall have a VOC content of 490 g/L or less.
 - b. Adhesive primer shall have a VOC content of 550 g/L or less.
 - c. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

 - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - a. PVC solvent cement shall have a VOC content of 510 g/L or less.
 - b. Adhesive primer shall have a VOC content of 550 g/L or less.
 - c. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- H. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.6 TRANSITION FITTINGS

- A. Plastic-to-Metal Transition Fittings:
 - 1. One-piece fitting with one threaded brass or copper insert and one solvent-cement-joint end of material and wall thickness to match plastic pipe material.

- B. Plastic-to-Metal Transition Unions:
 - 1. Brass or copper end, solvent-cement-joint end of material and wall thickness to match plastic pipe material, rubber gasket, and threaded union.

2.7 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

- B. Dielectric Unions:
 - 1. Description:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Standard: ASSE 1079.
- b. Pressure Rating: 125 psig minimum at 180 deg F.
- c. End Connections: Solder-joint copper alloy and threaded ferrous.
- d. Gasket: Garlock Gylon gasket

2.8 BYPASS CHEMICAL FEEDER

- A. Description: Welded steel construction; 125-psig working pressure; 5-gal. capacity; with fill funnel and inlet, outlet, and drain valves.
 1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-water heating piping, aboveground, 3" and smaller shall be the following:
 1. Type L (Type B), drawn-temper copper tubing, wrought-copper fittings, and brazed joints.
 2. Polypropylene pipe, fusion welded. Fire wrap piping in return plenums as necessary.
- B. Hot-water heating piping, aboveground, larger than 3" shall be the following:
 1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints
 2. Polypropylene pipe, fusion welded. Fire wrap piping in return plenums as necessary.
- C. Hot-Water Heating Piping Installed Belowground and within Slabs: Type K (Type A), annealed-temper copper tubing, wrought-copper fittings, and brazed joints. Use the fewest possible joints.
- D. Chilled-water piping, aboveground, 3" and smaller shall be the following:
 1. Type L (Type B), drawn-temper copper tubing, wrought-copper fittings, and brazed joints.
 2. Polypropylene pipe, fusion welded. Fire wrap piping in return plenums as necessary.
- E. Chilled-water piping, aboveground, larger than 3" shall be the following:
 1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints
 2. Polypropylene pipe, fusion welded. Fire wrap piping in return plenums as necessary.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- F. Chilled-Water Piping Installed Belowground and within Slabs: Type K (Type A), annealed-temper copper tubing, wrought-copper fittings, and brazed joints. Use the fewest possible joints.
- G. Condenser-water piping, aboveground, shall be any of the following:
 - 1. Type L (Type B), drawn-temper copper tubing, wrought-copper fittings, and brazed joints.
 - 2. Schedule 40 steel pipe; Class 250, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
 - 3. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints
 - 4. Schedule 80 CPVC plastic pipe and fittings and solvent-welded joints.
- H. Condenser-Water Piping Installed Belowground and within Slabs: Type K (Type A), annealed-temper copper tubing, wrought-copper fittings, and brazed joints. Use the fewest possible joints.
- I. Makeup-water piping installed aboveground shall be the following:
 - 1. Type L (Type B), drawn-temper copper tubing, wrought-copper fittings, and brazed joints.
- J. Makeup-Water Piping Installed Belowground and within Slabs: Type K (Type A), annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.
- K. Condensate-Drain Piping: Type M (Type C) Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints or Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.
- L. Condensate-Drain Piping: Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.
- M. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.
- N. Air-Vent Piping:
 - 1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.
 - 2. Outlet: Type K (Type A), annealed-temper copper tubing with soldered or flared joints.
- O. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

3.2 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 (DN 20) ball valve, and short NPS 3/4 (DN 20) threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains using mechanically formed tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install valves according to Section 230523.11 "Globe Valves for HVAC Piping," Section 230523.12 "Ball Valves for HVAC Piping," Section 230523.13 "Butterfly Valves for HVAC Piping," Section 230523.14 "Check Valves for HVAC Piping," and Section 230523.15 "Gate Valves for HVAC Piping."
- Q. Install unions in piping, NPS 2 (DN 50) and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- R. Install flanges in piping, NPS 2-1/2 (DN 65) and larger, at final connections of equipment and elsewhere as indicated.
- S. Install shutoff valve immediately upstream of each dielectric fitting.
- T. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.
- U. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.
- V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric unions.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.
- D. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.4 HANGERS AND SUPPORTS

- A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.
- B. Comply with requirements in Section 230548 "Vibration and Seismic Controls for HVAC" for seismic restraints.
- C. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet (6 m) long.
 - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet (6 m) or longer.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.
 4. Spring hangers to support vertical runs.
 5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
 6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.
- D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4 (DN 20): Maximum span, 7 feet (2.1 m).
 2. NPS 1 (DN 25): Maximum span, 7 feet (2.1 m).
 3. NPS 1-1/2 (DN 40): Maximum span, 9 feet (2.7 m).
 4. NPS 2 (DN 50): Maximum span, 10 feet (3 m).
 5. NPS 2-1/2 (DN 65): Maximum span, 11 feet (3.4 m).
 6. NPS 3 (DN 80) and Larger: Maximum span, 12 feet (3.7 m).
- E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4 (DN 20): Maximum span, 5 feet (1.5 m); minimum rod size, 1/4 inch (6.4 mm).
 2. NPS 1 (DN 25): Maximum span, 6 feet (1.8 m); minimum rod size, 1/4 inch (6.4 mm).
 3. NPS 1-1/4 ((DN 32:))Maximum span, 7 feet (2.1 m); minimum rod size, 3/8 inch (10 mm).
 4. NPS 1-1/2 (DN 40): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).
 5. NPS 2 (DN 50): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).
 6. NPS 2-1/2 (DN 65): Maximum span, 9 feet (2.7 m); minimum rod size, 3/8 inch (10 mm).
 7. NPS 3 (DN 80) and Larger: Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (10 mm).
- F. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.
- G. Support vertical runs at roof, at each floor, and at 10-foot (3-m) intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.
- E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 3. PVC Pressure Piping: Join ASTM D 1785 schedule number, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule number PVC pipe and socket fittings according to ASTM D 2855.
 - 4. PVC Nonpressure Piping: Join according to ASTM D 2855.
- H. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.
- I. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.

3.6 TERMINAL EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment.
- C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.
- D. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."

3.7 CHEMICAL TREATMENT

- A. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.
- B. Add initial chemical treatment and maintain water quality in ranges noted above for the first year of operation.
- C. Fill systems that have antifreeze or glycol solutions with the following concentrations:
 - 1. Hot-Water Heating Piping: Minimum of 30 percent propylene glycol.
 - 2. Chilled-Water Piping: Minimum of 30 percent propylene glycol.

3.8 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
 - 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 - 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 - 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
 - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 - 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 - 3. Isolate expansion tanks and determine that hydronic system is full of water.
 - 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
 - 5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening,

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

repairing, or replacing components, and repeat hydrostatic test until there are no leaks.

6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 232116 - HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes special-duty valves and specialties for the following:

1. Hot-water heating piping.
2. Chilled-water piping.
3. Condenser-water piping.
4. Makeup-water piping.
5. Condensate-drain piping.
6. Blowdown-drain piping.
7. Air-vent piping.
8. Safety-valve-inlet and -outlet piping.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Valves: Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
2. Air-control devices.
3. Hydronic specialties.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:

1. 125 psig at 200 deg F.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 VALVES

- A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Section 230523.11 "Globe Valves for HVAC Piping," Section 230523.12 "Ball Valves for HVAC Piping," Section 230523.13 "Butterfly Valves for HVAC Piping," Section 230523.14 "Check Valves for HVAC Piping," and Section 230523.15 "Gate Valves for HVAC Piping."
- B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 230923.11 "Control Valves" Section 15901 "Control Valves."
- C. Plastic Ball Valves:
 1. Body: One-, two-, or three-piece CPVC or PVC to match piping.
 2. Ball: Full-port CPVC or PVC to match piping.
 3. Seats: PTFE.
 4. Seals: EPDM.
 5. End Connections: Socket, union, or flanged.
 6. Handle Style: Tee shape.
 7. CWP Rating: Equal to piping service.
 8. Maximum Operating Temperature: Equal to piping service.
 9. Comply with MSS SP-122.
- D. Plastic Butterfly Valves:
 1. Body: PVC or CPVC to match piping wafer type for installation between flanges.
 2. Disc: EPDM-coated steel.
 3. Seats: PTFE.
 4. Handle Style: Locking lever.
 5. CWP Rating: Equal to piping service.
 6. Maximum Operating Temperature: Equal to piping service.
- E. Plastic Check Valves:
 1. Body: One-, two-, or three-piece PVC or CPVC to match piping.
 2. Ends: Socket or flanged.
 3. Seats: PTFE.
 4. Check Style: Swing or ball type.
 5. CWP Rating: Equal to piping service.
 6. Maximum Operating Temperature: Equal to piping service.
- F. Bronze, Calibrated-Orifice, Balancing Valves:
 1. Body: Bronze, ball or plug type with calibrated orifice or venturi.
 2. Ball: Brass or stainless steel.
 3. Plug: Resin.
 4. Seat: PTFE.
 5. End Connections: Threaded or socket.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

6. Pressure Gage Connections: Integral seals for portable differential pressure meter.
7. Handle Style: Lever, with memory stop to retain set position.
8. CWP Rating: Minimum 125 psig (860 kPa).
9. Maximum Operating Temperature: 250 deg F (121 deg C).

G. Diaphragm-Operated, Pressure-Reducing Valves: ASME labeled.

1. Body: Bronze or brass.
2. Disc: Glass and carbon-filled PTFE.
3. Seat: Brass.
4. Stem Seals: EPDM O-rings.
5. Diaphragm: EPT.
6. Low inlet-pressure check valve.
7. Inlet Strainer: Removable without system shutdown.
8. Valve Seat and Stem: Noncorrosive.
9. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

H. Diaphragm-Operated Safety Valves: ASME labeled.

1. Body: Bronze or brass.
2. Disc: Glass and carbon-filled PTFE.
3. Seat: Brass.
4. Stem Seals: EPDM O-rings.
5. Diaphragm: EPT.
6. Wetted, Internal Work Parts: Brass and rubber.
7. Inlet Strainer: Removable without system shutdown.
8. Valve Seat and Stem: Noncorrosive.
9. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

I. Automatic Flow-Control Valves:

1. Body: Brass or ferrous metal.
2. Piston and Spring Assembly: Stainless steel, tamper proof, self-cleaning, and removable.
3. Combination Assemblies: Include bronze or brass-alloy ball valve.
4. Identification Tag: Marked with zone identification, valve number, and flow rate.
5. Size: Same as pipe in which installed.
6. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
7. Minimum CWP Rating: 175 psig (1207 kPa).
8. Maximum Operating Temperature: 200 deg F (93 deg C).

2.3 AIR-CONTROL DEVICES

A. Manual Air Vents:

1. Body: Bronze.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2 (DN 15).
5. Discharge Connection: NPS 1/8 (DN 6).
6. CWP Rating: 150 psig (1035 kPa).
7. Maximum Operating Temperature: 225 deg F (107 deg C).

B. Expansion Tanks:

1. Tank: Welded steel, rated for 125-psig (860-kPa) working pressure and 375 deg F (191 deg C) maximum operating temperature, with taps in bottom of tank for tank fitting and taps in end of tank for gage glass. Tanks shall be factory tested after taps are fabricated and shall be labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless-steel ball check, 100-gal. (379-L) unit only; sized for compression-tank diameter. Provide tank fittings for 125-psig (860-kPa) working pressure and 250 deg F (121 deg C) maximum operating temperature.
3. Tank Drain Fitting: Brass body, nonferrous internal parts; 125-psig (860-kPa) working pressure and 240 deg F (116 deg C) maximum operating temperature; constructed to admit air to compression tank, drain water, and close off system.
4. Gage Glass: Full height with dual manual shutoff valves, 3/4-inch- (20-mm-) diameter gage glass, and slotted-metal glass guard.

C. In-Line Air Separators:

1. Tank: One-piece cast iron with an integral weir constructed to decelerate system flow to maximize air separation.
2. Maximum Working Pressure: Up to 175 psig (1207 kPa).
3. Maximum Operating Temperature: Up to 300 deg F (149 deg C).

2.4 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: Stainless-steel, 60-mesh strainer, or perforated stainless-steel basket.
4. CWP Rating: 125 psig (860 kPa).

B. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch (20-mm) misalignment.
4. CWP Rating: 150 psig (1035 kPa).

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

5. Maximum Operating Temperature: 250 deg F (121 deg C).

- C. Expansion Fittings: Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping." Section 15124 "Expansion Fittings and Loops for HVAC Piping."

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

- A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.
- B. Install calibrated-orifice, balancing valves at each branch connection to return main.
- C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.
- D. Install check valves at each pump discharge and elsewhere as required to control flow direction.
- E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.
- F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.2 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.
- B. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.
- C. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 (DN 50) and larger.
- D. Install expansion tanks above the air separator. Install tank fitting in tank bottom and charge tank. Use manual vent for initial fill to establish proper water level in tank.
 - 1. Install tank fittings that are shipped loose.
 - 2. Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- E. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure that tank is properly charged with air to suit system Project requirements.

END OF SECTION 232116

SECTION 232513 - WATER TREATMENT FOR CLOSED-LOOP HYDRONIC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following water treatment for closed-loop hydronic systems:
 - 1. Automatic chemical-feed equipment.
 - 2. Chemicals.

1.2 ACTION SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, and furnished specialties and accessories for each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 SCOPE OF WORK

- A. Determine existing system chemical treatment make up via sampling water and coordinating with facilities and/or existing chemical treatment service contractor.
- B. Flush new piping with temporary pump (using building pump is not acceptable).
- C. Provide new chemical to ensure adequate concentration once new piping is added to system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 PERFORMANCE REQUIREMENTS

- A. Closed hydronic systems shall have the following water qualities:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. pH: Maintain a value within 9.0 to 10.5.
2. "P" Alkalinity: Maintain a value within 100 to 500 ppm.
3. Boron: Maintain a value within 100 to 200 ppm.
4. Chemical Oxygen Demand: Maintain a maximum value of 100 ppm.
5. Soluble Copper: Maintain a maximum value of 0.20 ppm.
6. TSS: Maintain a maximum value of 10 ppm.
7. Ammonia: Maintain a maximum value of 20 ppm.
8. Free Caustic Alkalinity: Maintain a maximum value of 20 ppm.
9. Microbiological Limits:
 - a. Total Aerobic Plate Count: Maintain a maximum value of 1000 organisms/mL.
 - b. Total Anaerobic Plate Count: Maintain a maximum value of 100 organisms/mL.
 - c. Nitrate Reducers: Maintain a maximum value of 100 organisms/mL.
 - d. Sulfate Reducers: Maintain a maximum value of zero organisms/mL.
 - e. Iron Bacteria: Maintain a maximum value of zero organisms/mL.

2.3 AUTOMATIC CHEMICAL-FEED EQUIPMENT

A. Water Meter:

1. AWWA C700, oscillating-piston, magnetic-drive, totalization meter.
2. Body: Bronze.
3. Minimum Working-Pressure Rating: 150 psig.
4. Maximum Pressure Loss at Design Flow: 3 psig.
5. Registration: Gallons or cubic feet.
6. End Connections: Threaded.
7. Controls: Flow-control switch with normally open contacts; rated for maximum 10 A, 250-V ac; and that will close at adjustable increments of total flow.
8. 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. Chemical Solution Tanks:

1. Chemical-resistant reservoirs fabricated from high-density opaque polyethylene with minimum 110 percent containment vessel.
2. Molded cover with recess for mounting pump.
3. Capacity: 50 gal..

C. Chemical Solution Injection Pumps:

1. Self-priming, positive displacement; rated for intended chemical with minimum 25 percent safety factor for design pressure and temperature.
2. Adjustable flow rate.
3. Metal and thermoplastic construction.
4. Built-in relief valve.
5. Fully enclosed, continuous-duty, single-phase motor. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

6. 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.
- D. Chemical Solution Tubing: Polyethylene tubing with compression fittings and joints except ASTM A 269, Type 304, stainless steel for steam boiler injection assemblies.
- E. Injection Assembly:
1. Quill: Minimum NPS 1/2 with insertion length sufficient to discharge into at least 25 percent of pipe diameter.
 2. Ball Valve: Three-piece, stainless steel; selected to fit quill.
 3. Packing Gland: Mechanical seal on quill of sufficient length to allow quill removal during system operation.
 4. Assembly Pressure/Temperature Rating: Minimum 600 psig at 200 deg F.

2.4 CHEMICALS

- A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment and that can attain water quality specified in "Performance Requirements" Article.

PART 3 - EXECUTION

3.1 WATER ANALYSIS

- A. Perform an analysis of supply water to determine quality of water available at Project site.

3.2 INSTALLATION

- A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.
- B. Install seismic restraints for equipment and floor-mounting accessories and anchor to building structure. Comply with requirements in Section 230548 "Vibration and Seismic Controls for HVAC" for seismic restraints.
- C. Install water testing equipment on wall near water chemical application equipment.
- D. Install interconnecting control wiring for chemical treatment controls and sensors.
- E. Mount sensors and injectors in piping circuits.
- F. Bypass Feeders: Install in closed hydronic systems, including hot-water heating, and equipped with the following:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Install bypass feeder in a bypass circuit around circulating pumps unless otherwise indicated on Drawings.
 2. Install water meter in makeup-water supply.
 3. Install test-coupon assembly in bypass circuit around circulating pumps unless otherwise indicated on Drawings.
 4. Install a gate or full-port ball isolation valves on inlet, outlet, and drain below the feeder inlet.
 5. Install a swing check on the inlet after the isolation valve.
- G. Where installing piping adjacent to equipment, allow space for service and maintenance.
- H. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Comply with requirements in Section 232116 "Hydronic Piping Specialties"
- I. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Section 230523.11 "Globe Valves for HVAC Piping," Section 230523.12 "Ball Valves for HVAC Piping," Section 230523.13 "Butterfly Valves for HVAC Piping," and Section 230523.15 "Gate Valves for HVAC Piping."
- J. Comply with requirements in Section 221119 "Domestic Water Piping Specialties" for backflow preventers required in makeup-water connections to potable-water systems.
- K. Confirm applicable electrical requirements in electrical Sections for connecting electrical equipment.
- L. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- M. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Include one year of onsite service including chemical.
- B. Perform the following tests and inspections:
1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
 2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
 3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of hydronic systems' startup procedures.
 4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
 5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
 7. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
 8. Repair leaks and defects with new materials and retest piping until no leaks exist.
- C. Equipment will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 232513

SECTION 233113 - METAL DUCTS

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. Single-wall rectangular ducts and fittings.
 - 2. Single-wall round ducts and fittings.
 - 3. Sheet metal materials.
 - 4. Duct liner.
 - 5. Sealants and gaskets.
 - 6. Hangers and supports.
 - 7. Seismic-restraint devices.
- B. Related Sections:
 - 1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
 - 2. Section 233300 "Air Duct Accessories" for dampers, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
 - 1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.
 - 2. Seismic Hazard Level B: Seismic force to weight ratio, 0.30.
 - 3. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.
- B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 QUALITY ASSURANCE

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 GENERAL

- A. HVAC Duct shall be fabricated from galvanized steel in accordance with SMACNA requirements. Abrasive, corrosive, or hazardous materials shall be conveyed by systems described in Industrial Ventilation, latest edition, in harmony with the Fume Hood Section of these Design Standards. Nonmetallic duct shall not be used.
- B. All seams of ducts shall be sealed with mastic or mastic plus tape or gasketing as appropriate to limit the air leakage to SMACNA requirements.
- C. Flexible ductwork shall only be used at terminal units and shall not exceed eight feet. Hard turns, offsets, or kinks will not be allowed. Provide duct supports every three feet.
- D. High pressure ductwork shall be galvanized steel spiral lockseam construction.
- E. The high pressure duct and fittings shall be manufactured by the same firm.
- F. High pressure ductwork shall be tested and total allowable leakage of the system shall not exceed SMACNA requirements.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS – SEAL CLASS A

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Lindab Inc.](#)
 - b. [McGill AirFlow LLC.](#)
 - c. [SEMCO Incorporated.](#)
 - d. [Sheet Metal Connectors, Inc.](#)
 - e. [Spiral Manufacturing Co., Inc.](#)

- B. **Transverse Joints:** Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

- C. **Longitudinal Seams:** Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

- D. **Tees and Laterals:** Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 1. [Linx Industries \(formerly Lindab\).](#)
 2. [McGill AirFlow LLC.](#)
 3. [MKT Metal Manufacturing.](#)
 4. [SEMCO LLC.](#)
 5. [Sheet Metal Connectors, Inc.](#)

- B. **Flat-Oval Ducts:** Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.

- C. **Outer Duct:** Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - a. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
 2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - a. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 - b. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
 3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch-diameter perforations, with overall open area of 23 percent.
- E. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
 3. Coat insulation with antimicrobial coating.
 4. Cover insulation with polyester film complying with UL 181, Class 1.
- F. Interstitial Insulation: Flexible elastomeric duct liner complying with ASTM C 534, Type II for sheet materials, and with NFPA 90A or NFPA 90B.
1. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

2.5 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Galvanized Coating Designation: G60.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

2.6 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 2. Tape Width: 3 inches.
 3. Sealant: Modified styrene acrylic.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 7. Service: Indoor and outdoor.
 8. Service Temperature: Minus 40 to plus 200 deg F.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
 10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
 2. Solids Content: Minimum 65 percent.
 3. Shore A Hardness: Minimum 20.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. VOC: Maximum 75 g/L (less water).
 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 8. Service: Indoor or outdoor.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
 10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 11. VOC: Maximum 395 g/L.
 12. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
 13. Service: Indoor or outdoor.
 14. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
 2. Type: S.
 3. Grade: NS.
 4. Class: 25.
 5. Use: O.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- F. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg static-pressure class, positive or negative.
 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- F. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.8 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.; a division of Cooper Industries.
 2. Ductmate Industries, Inc.
 3. Hilti Corp.
 4. Kinetics Noise Control.
 5. Loos & Co.; Cableware Division.
 6. Mason Industries.
 7. TOLCO; a brand of NIBCO INC.
 8. Unistrut Corporation; Tyco International, Ltd..

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
 - 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- D. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.
- F. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class A.
 - 3. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
 - 4. Conditioned Space, Exhaust Ducts: Seal Class A
 - 5. Conditioned Space, Return-Air Ducts: Seal Class A.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 1. Where practical, install concrete inserts before placing concrete.
 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
 - 1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 - 2. Brace a change of direction longer than 12 feet.
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- G. Drilling for and Setting Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.6 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:
 - a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections totaling no less than 100 percent of total installed duct area for each designated pressure class.
 - b. Supply Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
 - c. Return Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
 - d. Exhaust Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
 - e. Outdoor Air Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than 100 percent of total installed duct area for each designated pressure class.
3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 DUCT CLEANING

A. Clean new and existing duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.

2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner or any ductwork noted on mechanical plans that require painting. Apply one coat of flat, latex paint over a compatible galvanized-steel primer.

3.10 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.11 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

3.12 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

- 1. Underground Ducts: Concrete-encased, PVC-coated, galvanized sheet steel with thicker coating on duct exterior or pre-insulated high-density polyethylene.

- B. Supply Ducts:

- 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

- a. Pressure Class: Positive 1-inch wg.
- b. Minimum SMACNA Seal Class: C.
- c. SMACNA Leakage Class for Rectangular: 24.
- d. SMACNA Leakage Class for Round and Flat Oval: 24.

- 2. Ducts Connected to Constant-Volume Air-Handling Units:

- a. Pressure Class: Positive 2-inch wg.
- b. Minimum SMACNA Seal Class: B.
- c. SMACNA Leakage Class for Rectangular: 12.
- d. SMACNA Leakage Class for Round and Flat Oval: 12.

- 3. Ducts Connected to Variable-Air-Volume Air-Handling Units:

- a. Pressure Class: Positive 4-inch wg.
- b. Minimum SMACNA Seal Class: A.
- c. SMACNA Leakage Class for Rectangular: 6.
- d. SMACNA Leakage Class for Round and Flat Oval: 3.

- C. Return Ducts:

- 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

- a. Pressure Class: Positive 1-inch wg.
- b. Minimum SMACNA Seal Class: C.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 24.
2. Ducts Connected to Air-Handling Units:
- a. Pressure Class: Positive or negative 3-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
- D. Exhaust Ducts:
1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
- a. Pressure Class: Negative 3-inch wg.
 - b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
2. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.
- a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
 - b. Concealed: Type 304, stainless-steel sheet, No. 2D finish.
 - c. Welded seams and joints.
 - d. Pressure Class: Positive or negative 2-inch wg.
 - e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
 - f. SMACNA Leakage Class: 3.
3. Ducts Connected to Dishwasher Hoods:
- a. Type 304, stainless-steel sheet.
 - b. Exposed to View: No. 4 finish.
 - c. Concealed: No. 2D finish.
 - d. Welded seams and flanged joints with watertight EPDM gaskets.
 - e. Pressure Class: Positive or negative 2-inch wg.
 - f. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
 - g. SMACNA Leakage Class: 3.
4. Ducts Connected to Fans Exhausting Laboratory and Process (ASHRAE 62.1, Class 3 and 4) Air:
- a. Type 316, stainless-steel sheet.
 - 1) Exposed to View: No. 4 finish.
 - 2) Concealed: No. 2B finish.
 - b. PVC-coated, galvanized sheet steel with thicker coating on duct interior.
 - c. Pressure Class: Positive or negative 4-inch wg.
 - d. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
 - e. SMACNA Leakage Class: 3.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:
 - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
 - a. Pressure Class: Positive 1-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 24.
 - 2. Ducts Connected to Air-Handling Units:
 - a. Pressure Class: Positive or negative 3-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
- F. Intermediate Reinforcement:
 - 1. Galvanized-Steel Ducts: Galvanized steel.
- G. Liner:
 - 1. Supply Air Ducts: Fibrous glass, Type I, 1 inch thick.
- H. Double-Wall Duct Interstitial Insulation:
 - 1. Supply Air Ducts: 1 inch thick.
 - 2. Acoustical Performance:
 - a. NRC: 1.09 according to ASTM C 423.
 - b. STC: 40 according to ASTM E 90.
- I. Elbow Configuration:
 - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - 2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
- b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
- c.
3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - 4) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter.
- J. Branch Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

BLANK PAGE

SECTION 233300 - AIR DUCT ACCESSORIES

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. Manual volume dampers.
 2. Control dampers.
 3. Turning vanes.
 4. Remote damper operators.
 5. Duct-mounted access doors.
 6. Flexible connectors.
 7. Flexible ducts.
 8. Duct accessory hardware.
 9. Louvers

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 1. Galvanized Coating Designation: G60.
 2. Exposed-Surface Finish: Mill phosphatized.
- B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2.
- C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Air Balance Inc.; a division of Mestek, Inc.](#)
 - b. [American Warming and Ventilating; a division of Mestek, Inc.](#)
 - c. [Flexmaster U.S.A., Inc.](#)
 - d. [McGill AirFlow LLC.](#)
 - e. [Nailor Industries Inc.](#)
 - f. [Pottorff.](#)
 - g. [Ruskin Company.](#)
 - h. [Trox USA Inc.](#)
 - i. [Vent Products Company, Inc.](#)
 - 2. Standard leakage rating
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:
 - a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
 - 6. Blade Axles: Galvanized steel.
 - 7. Bearings:
 - a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 - 8. Tie Bars and Brackets: Galvanized steel.

2.4 CONTROL DAMPERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
 - 1. [American Warming and Ventilating; a division of Mestek, Inc.](#)
 - 2. [Arrow United Industries; a division of Mestek, Inc.](#)
 - 3. [Cesco Products; a division of Mestek, Inc.](#)
 - 4. [Greenheck Fan Corporation.](#)
 - 5. [Lloyd Industries, Inc.](#)
 - 6. [McGill AirFlow LLC.](#)
 - 7. [Metal Form Manufacturing, Inc.](#)
 - 8. [Nailor Industries Inc.](#)

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

9. [NCA Manufacturing, Inc.](#)
10. [Pottorff.](#)
11. [Ruskin Company.](#)
12. [Vent Products Company, Inc.](#)
13. [Young Regulator Company.](#)

- B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
- C. Frames:
1. Hat shaped.
 2. 0.094-inch-thick, galvanized sheet steel.
 3. Mitered and welded corners.
- D. Blades:
1. Multiple blade with maximum blade width of 6 inches.
 2. Opposed-blade design.
 3. Galvanized-steel.
 4. 0.064 inch thick single skin.
 5. Blade Edging: Closed-cell neoprene.
 6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.
- E. Blade Axles: 1/2-inch-diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
1. Operating Temperature Range: From minus 40 to plus 200 deg F.
- F. Bearings:
1. Oil-impregnated bronze.
 2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 3. Thrust bearings at each end of every blade.

2.5 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. [Ductmate Industries, Inc.](#)
 2. [Duro Dyne Inc.](#)
 3. [Elgen Manufacturing.](#)
 4. [METALAIRE, Inc.](#)
 5. [SEMCO Incorporated.](#)
 6. [Ward Industries, Inc.; a division of Hart & Cooley, Inc.](#)
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vaness and Vane Runners," and 4-4, "Vane Support in Elbows."
- D. Vane Construction: Single wall.
- E. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.6 REMOTE DAMPER OPERATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. [Pottorff](#).
 - 2. [Ventfabrics, Inc.](#)
 - 3. [Young Regulator Company..](#)
- B. Description: Cable system designed for remote manual damper adjustment.
- C. Tubing: Brass.
- D. Cable: Stainless steel.
- E. Wall-Box Mounting: Recessed.
- F. Wall-Box Cover-Plate Material: Steel.

2.7 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. [American Warming and Ventilating; a division of Mestek, Inc.](#)
 - 2. [Cesco Products; a division of Mestek, Inc.](#)
 - 3. [Ductmate Industries, Inc.](#)
 - 4. [Elgen Manufacturing.](#)
 - 5. [Flexmaster U.S.A., Inc.](#)
 - 6. [Greenheck Fan Corporation.](#)
 - 7. [McGill AirFlow LLC.](#)
 - 8. [Nailor Industries Inc.](#)
 - 9. [Pottorff.](#)
 - 10. [Ventfabrics, Inc.](#)
 - 11. [Ward Industries, Inc.; a division of Hart & Cooley, Inc.](#)
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
 - 1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inchbutt or piano hinge and cam latches.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- e. Fabricate doors airtight and suitable for duct pressure class.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Continuous and two sash locks.
 - c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.
 - d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

2.8 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. [Ductmate Industries, Inc.](#)
 2. [Duro Dyne Inc.](#)
 3. [Elgen Manufacturing.](#)
 4. [Ventfabrics, Inc.](#)
 5. [Ward Industries, Inc.; a division of Hart & Cooley, Inc.](#)
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 1. Minimum Weight: 26 oz./sq. yd..
 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 3. Service Temperature: Minus 40 to plus 200 deg F.

2.9 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. [Flexmaster U.S.A., Inc.](#)
 2. [McGill AirFlow LLC.](#)
 3. [Ward Industries, Inc.; a division of Hart & Cooley, Inc.](#)
- B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
 1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
 2. Maximum Air Velocity: 4000 fpm.
 3. Temperature Range: Minus 20 to plus 175 deg F.
 4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1.
- C. Flexible Duct Connectors:
 1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

2.10 LOUVERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Ruskin Company
 2. Greenheck Fan Corporation
 3. Pottorff
- B. Fabrication: Hidden support style.
 1. Frame:
 - a. Frame Depth: 6 inches .
 - b. Material: Extruded aluminum, Alloy 6063-T5.
 - c. Wall Thickness: 0.125 inch, nominal.
 2. Blades:
 - a. Style: Drainable.
 - b. Material: Formed aluminum, Alloy 6063-T5.
 - c. Wall Thickness: 0.081 inch, nominal.
 - d. Angle: 37-1/2 degrees.
 - e. Centers: 4 inches, nominal.
 3. Gutters: Drain gutter in head frame and each blade.
 4. Downspouts: Downspouts in jambs to drain water from louver for minimum water cascade from blade to blade.
 5. Fabrication:
 - a. Mullion/Hidden Intermediate Support Style – Design incorporates visible mullions or frames at the perimeter of the louver and at section joints only. Rear-mounted hidden blade supports are utilized where required and do not interrupt the louver blade sightlines. The rear-mounted blade support depth varies depending on louver height and the design windload.
 6. Assembly:
 - a. Factory assembled louver components. Mechanically fastened construction.
- C. Performance Data:
 1. Performance Ratings: AMCA licensed.
 - a. Based on testing 48 inch by 48 inch size unit in accordance with AMCA 500.
 2. Free Area: 58 percent, nominal.
 3. Maximum Recommended Air Flow through Free Area: 1250 feet per minute.
 4. Air Flow: 11,600 cubic feet per minute.
 5. Maximum Pressure Drop (Intake): 0.20 inches w.g. .
 6. Water Penetration: Maximum of 0.01 ounces per square foot of free area at an air flow of 1250 feet per minute free area velocity when tested for 15 minutes.
- D. Bird Screen:
 1. Aluminum: Aluminum, 1/4 inch x 1/4 inch.
 2. Frame: Removable, rewireable.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
- F. Install access doors with swing against duct static pressure.
- G. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.
 - 5. Body Access: 25 by 14 inches.
 - 6. Body plus Ladder Access: 25 by 17 inches.
- H. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- I. Install flexible connectors to connect ducts to equipment.
- J. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- K. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- L. Connect diffusers or light troffer boots to ducts in-directly with maximum 36-inch lengths of flexible duct clamped or strapped in place. Do not use flexible ducts to change directions.
- M. Connect flexible ducts to metal ducts with liquid adhesive plus clamp-type draw bands.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- N. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 - 3. Inspect turning vanes for proper and secure installation.
 - 4. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. In-line centrifugal fans.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: 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. Wiring Diagrams: For power, signal, and control wiring.
 - 3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
 - 4. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.4 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. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

2.1 IN-LINE CENTRIFUGAL FANS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - 1. [Carnes Company.](#)
 - 2. [Greenheck Fan Corporation.](#)
 - 3. [Loren Cook Company.](#)
 - 4. [PennBarry.](#)
- B. **Housing:** Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. **Direct-Drive Units:** Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel, inlet cone, and motor on swing-out service door.
- D. **Belt-Driven Units:** Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.
- E. **Fan Wheels:** Aluminum, airfoil blades welded to aluminum hub.
- F. **Accessories:**
 - 1. **Variable-Speed Controller:** Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. **Volume-Control Damper:** Manually operated with quadrant lock, located in fan outlet.
 - 3. **Companion Flanges:** For inlet and outlet duct connections.
 - 4. **Fan Guards:** 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
 - 5. **Motor and Drive Cover (Belt Guard):** Epoxy-coated steel.
- G. **Capacities and Characteristics:**
 - 1. See drawings.

2.2 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 1. **Motor Sizes:** Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- B. **Enclosure Type:** Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL

- A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Equipment Mounting:
 - 1. Install power ventilators on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete".
 - 2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
 - 3. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."
- B. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 077200 "Roof Accessories" for installation of roof curbs.
- C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
- D. Support suspended units from structure using threaded steel rods and spring hangers with vertical-limit stops having a static deflection of 1 inch. Vibration-control devices are specified in Section 230548 "Vibration and Seismic Controls for HVAC." Section 230548.13 "Vibration Controls for HVAC."
- E. Install units with clearances for service and maintenance.
- F. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 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. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.
 - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 - 5. Adjust belt tension.
 - 6. Adjust damper linkages for proper damper operation.
 - 7. Verify lubrication for bearings and other moving parts.
 - 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 - 9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 - 10. Shut unit down and reconnect automatic temperature-control operators.
 - 11. Remove and replace malfunctioning units and retest as specified above.
- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Replace fan and motor pulleys as required to achieve design airflow.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
E. Lubricate bearings.

END OF SECTION 233423

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 233600 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Parallel fan-powered air terminal units
 - 2. Dual-Duct Air Terminal Units
 - 3. Shutoff, single-duct air terminal units.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Prerequisite EQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
- C. Shop Drawings: For air terminal units. Include plans, elevations, sections, details, and attachments to other work.
- D. Delegated-Design Submittal:
 - 1. Materials, fabrication, assembly, and spacing of hangers and supports.
 - 2. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting hangers and supports and seismic restraints.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.

2.2 PARALLEL FAN-POWERED AIR TERMINAL UNITS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - 1. [Krueger](#).
 - 2. [Price Industries](#).
 - 3. [Titus](#).
 - 4. [Trane](#).
- B. Configuration: Volume-damper assembly and fan in parallel arrangement inside unit casing with control components inside a protective metal shroud. Low-profile design.
- C. Casing: 0.034-inch-thick galvanized steel, single wall.
 - 1. Casing Liner: Comply with requirements in "Casing Liner" Article for fibrous-glass duct liner.
 - 2. Air Inlets: Round stub connections or S-slip and drive connections for duct attachment.
 - 3. Air Outlet: S-slip and drive connections.
 - 4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket and quarter-turn latches.
 - 5. Fan: Forward-curved centrifugal, located at plenum air inlet.
 - 6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- D. Volume Damper: Galvanized steel with flow-sensing ring and peripheral gasket and self-lubricating bearings.
 - 1. Maximum Damper Leakage: AHRI 880 rated, 2 percent of nominal airflow at 6-inch wg inlet static pressure.
 - 2. Damper Position: Normally closed.
- E. Velocity Sensors: Multipoint array with velocity sensors.
- F. Motor:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 2. Type: Electronically commutated motor.
 3. Fan-Motor Assembly Isolation: Rubber isolators.
 4. Enclosure: Totally enclosed, air over.
 5. Enclosure Materials: Cast iron.
 6. Unusual Service Conditions:
 - a. Ambient Temperature: 70 F
 - b. Altitude: 4,500 above sea level.
 - c. High humidity.
 7. Efficiency: Premium efficient.
 - a. Speed Control: Infinitely adjustable with pneumatic-electric and electronic controls.
 8. Electrical Characteristics: See drawings
- G. Filters: Minimum arrestance and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
1. Material: Pleated cotton-polyester media having 90 percent arrestance and 7 MERV.
 2. Thickness: 1 inch.
- H. Attenuator Section: 0.032-inch aluminum sheet.
1. Attenuator Section Liner: Comply with requirements in "Casing Liner" Article for fibrous-glass duct liner.
 2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- I. Hydronic Heating Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.
1. Location: Plenum air inlet.
- J. Factory-Mounted and -Wired Controls: Electrical components mounted in control box with removable cover. Incorporate single-point electrical connection to power source.
1. Control Transformer: Factory mounted for control voltage on electric and electronic control units with terminal strip in control box for field wiring of thermostat and power source.
 2. Wiring Terminations: Fan and controls to terminal strip. Terminal lugs to match quantities, sizes, and materials of branch-circuit conductors. Enclose terminal lugs in terminal box that is sized according to NFPA 70.
 3. Disconnect Switch: Factory-mounted, fuse type.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- K. Control Panel Enclosure: NEMA 250, Type 1, with access panel sealed from airflow and mounted on side of unit.

- L. Control devices shall be compatible with temperature controls system specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
 - 1. Electric Damper Actuator: 24 V, powered open, spring return.
 - 2. Electronic Thermostat: Wall-mounted electronic type with temperature set-point display in Fahrenheit and Celsius.
 - 3. Electronic Velocity Controller: Factory calibrated and field adjustable to minimum and maximum air volumes; shall maintain constant airflow dictated by thermostat within 5 percent of set point while compensating for inlet static-pressure variations up to 4-inch wg; and shall have a multipoint velocity sensor at air inlet.
 - 4. Terminal Unit Controller: Pressure-independent, VAV controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:

- M. Control Sequence:
 - 1. Occupied (Primary Airflow On):
 - a. Operate as throttling control for cooling.
 - b. As cooling requirement decreases, control valve throttles toward minimum airflow.
 - c. As heating requirement increases, fan energizes to draw in warm plenum air and the hot-water coil valve is energized.

 - 2. Unoccupied (Primary Airflow Off):
 - a. When pressure at primary inlet is zero or less, fan is de-energized.
 - b. As heating requirement increases, fan energizes to draw in warm plenum air and the hot-water coil valve will be energized.

2.3 DUAL-DUCT AIR TERMINAL UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Krueger.
 - 2. Price Industries.
 - 3. Titus.
 - 4. Trane.

- B. Configuration: Mixing with two volume dampers inside unit casing with mixing attenuator section and control components inside a protective metal shroud.

- C. Casing: 0.034-inch-thick galvanized steel, single wall.
 - 1. Casing Liner: Comply with requirements in "Casing Liner" Article for fibrous-glass duct liner.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Air Inlets: Round stub connections or S-slip and drive connections for duct attachment.
 3. Air Outlet: S-slip and drive connections.
 4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
 5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- D. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.
1. Maximum Damper Leakage: AHRI 880 rated, 3 percent of nominal airflow at 6-inch wg inlet static pressure.
 2. Damper Position: Normally closed.
- E. Velocity Sensors: Multipoint array with velocity sensors in air inlets and air outlets.
- F. Attenuator Section: 0.032-inch aluminum sheet.
1. Attenuator Section Liner: Comply with requirements in "Casing Liner" Article for fibrous-glass duct liner.
 2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- G. Control devices shall be compatible with temperature controls system specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
1. Electronic Damper Actuator: 24 V, powered open, spring return.
 2. Electronic Thermostat: Wall-mounted electronic type with temperature set-point display in Fahrenheit and Celsius.
 3. Electronic Velocity Controller: Factory calibrated and field adjustable to minimum and maximum air volumes; shall maintain constant airflow dictated by thermostat within 5 percent of set point while compensating for inlet static-pressure variations up to 4-inch wg; and shall have a multipoint velocity sensor at air inlet.
 4. Terminal Unit Controller: Pressure-independent, VAV controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:
- H. Control Sequence:
1. Room thermostat modulates VAV damper and dual-duct damper.
 2. When Space Temperature Is below Set Point: Close VAV damper, open hot-deck dampers and close cold-deck dampers, then open VAV damper.
 3. When Space Temperature Is above Set Point: Close VAV damper, close hot-deck dampers and open cold-deck dampers, then open VAV damper.
 4. Occupancy sensor reports occupancy and enables occupied temperature set point.
 5. Occupancy sensor switches set point from occupied setting to unoccupied setting.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
2.4 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - 1. [Krueger](#).
 - 2. [Price Industries](#).
 - 3. [Titus](#).
 - 4. [Trane](#).
- B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.
- C. Casing: 0.032-inch aluminum, single wall.
 - 1. Casing Lining: Adhesive attached, 1/2-inch-thick, coated, fibrous-glass duct liner complying with ASTM C 1071, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
 - a. Cover liner with nonporous foil.
 - 2. Casing Lining: Adhesive attached, 1-inch-thick, polyurethane foam insulation complying with UL 181 erosion requirements, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
 - 3. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
 - 4. Air Outlet: S-slip and drive connections, size matching inlet size.
 - 5. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
 - 6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- D. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.
 - 1. Maximum Damper Leakage: ARI 880 rated, percent of nominal airflow at 6-inch wg inlet static pressure.
 - 2. Damper Position: Normally closed.
- E. Attenuator Section: 0.032-inch aluminum sheet.
 - 1. Lining: Adhesive attached, 1-inch-thick, coated, fibrous-glass duct liner complying with ASTM C 1071, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
 - a. Cover liner with nonporous foil and perforated metal.
- F. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- G. Direct Digital Controls: Single-package unitary controller and actuator specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
- H. Direct Digital Controls: Bidirectional damper operators and microprocessor-based controller and room sensor. Control devices shall be compatible with temperature controls specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and shall have the following features:
 - 1. Damper Actuator: 24 V, powered closed, powered open.
 - 2. Terminal Unit Controller: Pressure-independent, variable-air-volume controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:
 - a. Occupied and unoccupied operating mode.
 - b. Remote reset of airflow or temperature set points.
 - c. Adjusting and monitoring with portable terminal.
 - d. Communication with temperature-control system specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
 - 3. Room Sensor: Wall mounted, with temperature set-point adjustment and access for connection of portable operator terminal.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Steel Cables: Galvanized steel complying with ASTM A 603.
- D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- E. Air Terminal Unit Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- F. Trapeze and Riser Supports: Steel shapes and plates for units with steel casings; aluminum for units with aluminum casings.

2.6 SEISMIC-RESTRAINT DEVICES

- A. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- B. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- C. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; with an automatic-locking and clamping device or double-cable clips.
- D. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- E. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.7 SOURCE QUALITY CONTROL

- A. Factory Tests: Test assembled air terminal units according to ARI 880.
 1. Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and ARI certification seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."
- B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.
- C. Install wall-mounted thermostats.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 1. Where practical, install concrete inserts before placing concrete.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes and for slabs more than 4 inches thick.
 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes and for slabs less than 4 inches thick.
 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hangers Exposed to View: Threaded rod and angle or channel supports.
- D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install hangers and braces designed to support the air terminal units and to restrain against seismic forces required by applicable building codes. Comply with ASCE/SEI 7.
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on air terminal units that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- G. Drilling for and Setting Anchors:
1. Identify position of reinforcing steel and other embedded items before drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 3. Wedge Anchors: Protect threads from damage during anchor installation. Install heavy-duty sleeve anchors with sleeve fully engaged in the structural element to which anchor is to be fastened.
 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
 5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
3.4 CONNECTIONS

- A. Install piping adjacent to air terminal unit to allow service and maintenance.
- B. Hot-Water Piping: In addition to requirements in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties," Section 15179 "Hydronic Piping Specialties," connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.
- C. Connect ducts to air terminal units according to
- D. Make connections to air terminal units with flexible connectors complying with requirements in Section 233300 "Air Duct Accessories."

3.5 IDENTIFICATION

- A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

3.6 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. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Leak Test: After installation, fill water coils 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 motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Air terminal unit will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.7 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION 233600

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Round ceiling diffusers.
2. Rectangular and square ceiling diffusers.
3. Perforated diffusers.
4. Louver face diffusers.
5. Linear bar diffusers.
6. Linear slot diffusers.
7. Adjustable bar grilles.
8. Fixed face grilles.
9. Linear bar grilles.

B. Related Sections:

1. Section 089116 "Operable Wall Louvers" and Section 089119 "Fixed Louvers" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers:

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- a. [Anemostat Products; a Mestek company.](#)
- b. [Carnes Company.](#)
- c. [Hart & Cooley Inc.](#)
- d. [Krueger.](#)
- e. [Nailor Industries Inc.](#)
- f. [Price Industries.](#)
- g. [Shoemaker Mfg. Co.](#)
- h. [Titus.](#)
- i. [Tuttle & Bailey.](#)

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: Baked enamel, color selected by Architect.
5. Face Size: See drawings
6. Face Style: See drawings
7. Mounting: See drawings
8. Pattern: See drawings
9. Dampers: Radial opposed blade.
10. Accessories:

- a. Equalizing grid.
- b. Plaster ring.
- c. Safety chain.
- d. Wire guard.
- e. Sectorizing baffles.
- f. Operating rod extension.

B. Perforated Diffuser:

1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
 - a. [Anemostat Products; a Mestek company.](#)
 - b. [Carnes Company.](#)
 - c. [Hart & Cooley Inc.](#)
 - d. [Krueger.](#)
 - e. [Nailor Industries Inc.](#)
 - f. [Price Industries.](#)
 - g. [Shoemaker Mfg. Co.](#)
 - h. [Titus.](#)
 - i. [Tuttle & Bailey.](#)
- 2.
3. Devices shall be specifically designed for variable-air-volume flows.
4. Material: Steel backpan and pattern controllers, with aluminum face.
5. Finish: Baked enamel, color selected by Architect.
6. Face Size: See drawings
7. Duct Inlet: See drawings
8. Face Style: Flush.
9. Mounting: See drawings.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

10. Pattern Controller: None.
11. Dampers: None
12. Accessories:
 - a. Equalizing grid.
 - b. Plaster ring.
 - c. Safety chain.
 - d. Wire guard.
 - e. Sectorizing baffles.
 - f. Operating rod extension.

C. Louver Face Diffuser:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Anemostat Products; a Mestek company.](#)
 - b. [Carnes Company.](#)
 - c. [Hart & Cooley Inc.](#)
 - d. [Krueger.](#)
 - e. [Nailor Industries Inc.](#)
 - f. [Price Industries.](#)
 - g. [Shoemaker Mfg. Co.](#)
 - h. [Titus.](#)
 - i. [Tuttle & Bailey.](#)
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: Baked enamel, color selected by Architect.
5. Face Size: See drawings
6. Mounting: See Drawings
7. Pattern: See Drawings
8. Dampers: Radial opposed blade.
9. Accessories:
 - a. Square to round neck adaptor.
 - b. Adjustable pattern vanes.
 - c. Throw reducing vanes.
 - d. Equalizing grid.
 - e. Plaster ring.
 - f. Safety chain.
 - g. Wire guard.
 - h. Sectorizing baffles.
 - i. Operating rod extension.

2.2 CEILING LINEAR SLOT OUTLETS

A. Linear Bar Diffuser:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anemostat Products; a Mestek company.
 - b. Carnes Company.
 - c. Hart & Cooley Inc.
 - d. Krueger.
 - e. Nailor Industries Inc.
 - f. Price Industries.
 - g. Shoemaker Mfg. Co.
 - h. Titus.
 - i. Tuttle & Bailey.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: Baked enamel, color selected by Architect.
5. Narrow Core Spacing Arrangement: 1/8-inch-thick blades spaced 1/4 inch apart, 15-degree deflection.
6. Frame: 1 inch wide.

B. Linear Slot Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anemostat Products; a Mestek company.
 - b. Carnes Company.
 - c. Hart & Cooley Inc.
 - d. Krueger.
 - e. Nailor Industries Inc.
 - f. Price Industries.
 - g. Shoemaker Mfg. Co.
 - h. Titus.
 - i. Tuttle & Bailey.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material - Shell: Aluminum,.
4. Material - Pattern Controller and Tees: Aluminum.
5. Finish - Face and Shell: Baked enamel, black.
6. Finish - Pattern Controller: Baked enamel, black.
7. Finish - Tees: Baked enamel, color selected by Architect.
8. Slot Width: See drawings.
9. Number of Slots: See drawings.
10. Length: See Drawings.
11. Accessories: Engineered plenum.

2.3 REGISTERS AND GRILLES

A. Adjustable Bar Register:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. Anemostat Products; a Mestek company.
 - b. Carnes Company.
 - c. Hart & Cooley Inc.
 - d. Krueger.
 - e. Nailor Industries Inc.
 - f. Price Industries.
 - g. Shoemaker Mfg. Co.
 - h. Titus.
 - i. Tuttle & Bailey.
2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Face Blade Arrangement: Horizontal spaced 1/2 inch apart.
5. Core Construction: Integral.

2.4 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 260500

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 260519

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:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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."

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 260526

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.

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. Korns: C. C. Korns 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, finned, stranded, unless otherwise indicated.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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 260533

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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. Alflex 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.3 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers:
 - 1. American International.
 - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 3. Arnco 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).

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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 260548

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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

SECTION 260923

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 262200

LOW VOLTAGE TRANSFORMERS

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 dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:
 - 1. Distribution transformers.
 - 2. Control and signal transformers.

1.3 SUBMITTALS

- A. Product Data Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.
- B. Shop Drawings: Wiring and connection diagrams.
- C. Manufacturer Seismic Qualification Certification: Submit certification that transformer assembly 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 specified."
 - 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.
- D. Source quality-control test reports.
- E. Output Settings Reports: Record of tap adjustments specified in Part 3.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 IEEE C 57.12.91.
- C. Energy-Efficient Transformers Rated 15 kVA and Larger: Certified as meeting NEMA TP 1, Class 1 efficiency levels when tested according to NEMA TP 2.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.6 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.
- B. Coordinate installation of wall-mounting and structure-hanging supports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1.
 - 2. Cutler-Hammer.
 - 3. GE Electrical Distribution & Control.
 - 4. Siemens Energy & Automation, Inc.
 - 5. Square D/Groupe Schneider NA.

2.2 MATERIALS

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
- B. Cores: Grain-oriented, non-aging silicon steel.
- C. Coils: Continuous windings without splices, except for taps.
 - 1. Internal Coil Connections: Brazed or pressure type.
 - 2. Coil Material: Copper or aluminum.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

2.3 DISTRIBUTION TRANSFORMERS

- A. Comply with NEMA ST 20, and list and label as complying with UL 1561.
- B. Provide transformers that are internally braced to withstand seismic forces specified in Division 26 Section "Seismic Controls for Electrical Work."
- C. Cores: One leg per phase.
- D. Enclosure: Ventilated, dripproof, NEMA 250, Type 2.
- E. Indoor Transformer Enclosure Finish: Comply with NEMA 250 for "Indoor Corrosion Protection."
 - 1. Finish Color: Gray.
- F. Outdoor Transformer Enclosure Finish: Comply with NEMA 250 for "Outdoor Corrosion Protection."
 - 1. Finish Color: Gray.
- G. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.
- H. Taps for Transformers Smaller Than 3 kVA: One 5 percent tap above normal full capacity.
- I. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.
- J. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.
- K. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.
 - 1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
 - 2. Indicate value of K-factor on transformer nameplate.
- L. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.
 - 1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
 - 2. Include special terminal for grounding the shield.
 - 3. Shield Effectiveness:
 - a. Capacitance between Primary and Secondary Windings: Not to exceed 33 picofarads over a frequency range of 20 Hz to 1 MHz.
 - b. Common-Mode Noise Attenuation: Minus 120 dBA minimum at 0.5 to 1.5 kHz; minus 65 dBA minimum at 1.5 to 100 kHz.
 - c. Normal-Mode Noise Attenuation: Minus 52 dBA minimum at 1.5 to 10 kHz.
- M. Wall Brackets: Manufacturer's standard brackets.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- N. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.4 CONTROL AND SIGNAL TRANSFORMERS

- A. Description: Self-cooled, two-winding dry type, rated for continuous duty, complying with NEMA ST 1, and listed and labeled as complying with UL 506.
- B. Ratings: Continuous duty. If rating is not indicated, provide at least 50 percent spare capacity above connected peak load.

2.5 SOURCE QUALITY CONTROL

- A. Test and inspect transformers according to IEEE C57.12.91.
- B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.
- B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.
- C. Examine walls and floors for suitable mounting conditions where transformers will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.
 - 1. Brace wall-mounting transformers as specified in Division 26 Section "Seismic Controls for Electrical Work."
- B. Install floor-mounting transformers level on concrete bases. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit and 4 inches high.
 - 1. Anchor transformers to concrete bases according to manufacturer's written instructions, seismic codes at Project, and requirements in Division 26 Section "Seismic Controls for Electrical Work."

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 ADJUSTING

- A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 5 percent. Submit recording and tap settings as test results.
- B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

END OF SECTION 262200

SECTION 262416

PANELBOARDS

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. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.
 - 3. Transient voltage suppression panelboards.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, current, and voltage ratings.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. UL listing for series rating of installed devices.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 2. Wiring Diagrams: Power, signal, and control wiring.
 - C. Manufacturer Seismic Qualification Certification: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 26 Section "Seismic Controls for Electrical Work." Include the following:
 1. Basis of 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 specified and the unit will be fully operational after the seismic event."
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - D. Field quality-control test reports including 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.
 - E. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Procedures," include the following:
 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 2. Time-current curves, including selectable ranges for each type of overcurrent protective device.
- 1.5 QUALITY ASSURANCE
- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.
 - B. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- C. 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.
- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
 - 1. Ambient Temperature: Not exceeding 104 deg F.
 - 2. Altitude: Not exceeding 6600 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 - 1. Ambient temperatures within limits specified.
 - 2. Altitude not exceeding 6600 feet.

1.7 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

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. Keys: Six spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Eaton Corporation; Cutler-Hammer Products.
 - b. General Electric Co.; Electrical Distribution & Protection Div.
 - c. Siemens Energy & Automation, Inc.
 - d. Square D.

2.2 MANUFACTURED UNITS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Work."
- B. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.
 1. Rated for environmental conditions at installed location.
 - a. Outdoor Locations: NEMA 250, Type 3R.
 2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 3. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
 4. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.
- C. Phase and Ground Buses:
 1. Material: Hard-drawn copper, 98 percent conductivity or tin-plated aluminum.
 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
 3. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box.
- D. Conductor Connectors: Suitable for use with conductor material.
 1. Main and Neutral Lugs: Mechanical type.
 2. Ground Lugs and Bus Configured Terminators: Compression type.
 3. Feed-Through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
- E. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- F. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.3 PANELBOARD SHORT-CIRCUIT RATING

- A. UL label indicating series-connected rating with integral or remote upstream overcurrent protective devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.

2.4 DISTRIBUTION PANELBOARDS

- A. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.
- B. Main Overcurrent Protective Devices: Circuit breaker.
- C. Branch Overcurrent Protective Devices:
 - 1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
 - 2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
 - 3. Fused switches.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Hinged front cover with tumbler lock; keyed alike.

2.6 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. Electronic trip-unit circuit breakers shall have RMS sensing; field-replaceable rating plug; and with the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
 - 4. GFCI Circuit Breakers: Single- and two-pole configurations with 5 or 30-mA trip sensitivity, as required by the load served.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 - 1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 - 3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - 4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
 - 5. Multipole units enclosed in a single housing or factory-assembled to operate as a single unit.
- C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

2.7 ACCESSORY COMPONENTS AND FEATURES

- A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Furnish portable test set to test functions of solid-state trip devices without removal from panelboard.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Seismic Controls for Electrical Work."
- C. Mount top of trim 74 inches above finished floor, unless otherwise indicated.
- D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- E. Install overcurrent protective devices and controllers.
 - 1. Set field-adjustable switches and circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
- G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Common Work Results for Electrical."
- B. Create a directory to indicate installed circuit loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

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."

3.4 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.5 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 262416

SECTION 262726

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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-

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
 INTERMOUNTAIN KBT 22
 36 S. State Street
 Salt Lake City, Utah

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		
<p>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.</p>		
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	Hubbell CS1223 Leviton 1223 P & S 523

INTERMOUNTAIN WTC 19
 INTERMOUNTAIN KBT 22
 36 S. State Street
 Salt Lake City, Utah

	Specification W-S-896. Provide Nylon or Lexan face, back and side wired. Rated 1 HP 120V.	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 multiservice 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 265100
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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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

SECTION 270000 – 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,

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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)

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 270100 - 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 270113 – 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,

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 270119 – 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
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.

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 IIIe 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:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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 50/125 μ m and 62.5/125 μ m 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 270186 – 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 270500 – 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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 270526 - 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

SECTION 270528 - 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 270529 - 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 270533 – 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 or 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..

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

END OF SECTION

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 270539 – 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

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 271100 - 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 programming 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 within 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 within 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 within 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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, inter-connect, 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 271119 - 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

SECTION 271300 - 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 50/125μm (OM2), including 50/125μm Laser Optimized (OM3). Note: 62.5/125μm (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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
END OF SECTION

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 271543 – 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 271619 – 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. Siemon 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 274114

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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 cancellors 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 cancellors, 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 cancellor, 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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 274115

SECTION 274115

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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, scalers, 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, scalers, 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, scalers, 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 gasketted 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 grommets 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 274116
CONTROLSYSTEMS

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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 scalars, 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

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 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

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 the drawings.

PART 3 - EXECUTION

3.1 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.

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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 (Boeckler 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,

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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. **CONFERENCING 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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".

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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,

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 grommets 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

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. 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

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. 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.

3.6 CLEANING AND PROTECTION

- A. Prior to final acceptance, clean system components and protect from damage and deterioration.

END OF SECTION 274116

SECTION 275119
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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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. Approved installer for this project is Marshall Industries.
- 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.

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
 INTERMOUNTAIN KBT 22
 36 S. State Street
 Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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 276001 – 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah
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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 276002 – 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

SECTION 276004 – 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:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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 276005 – 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

INTERMOUNTAIN WTC 19

INTERMOUNTAIN KBT 22

36 S. State Street

Salt Lake City, Utah

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

SECTION 276006 – 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

END OF SECTION

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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

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. User selected installer: ALPHACORP.

1.2 SUMMARY

- A. This section includes the installation of a new PC based and managed access control and security system (Lenel) and specifies sensors, signal equipment, and system controls.
- B. The electrified locking and access hardware for this project is specified using ASSA ABLOY products that will require the security contractor to provide integrated access control connection locking devices and wire harnesses.

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.

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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 to 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.**

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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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. Long range readers mounted at vehicle gates shall have a minimum 10 inch read range.

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 overhead doors that are not supplied by the door manufacturer shall be Sentrol series 2300 type surface mounted magnetic reed type switches with

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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, $\frac{3}{4}$ 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 $\frac{3}{8}$ " diameter threaded rod and provide tie to ceiling grid to prevent sway.
 - 3. Exposed: Install exposed cables in minimum $\frac{3}{4}$ " galvanized rigid metal conduit with straps at not more than 3 feet on center and minimum $\frac{1}{4}$ " 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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. User selected installer: ALPHACORP.

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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)

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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:

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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.

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

- 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

INTERMOUNTAIN WTC 19
INTERMOUNTAIN KBT 22
36 S. State Street
Salt Lake City, Utah

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