UNIVERSITY OF COLORADO DENVER

CU Denver Building Convert Room 1110 & 1120 to City Center

PN 18-115993

STATE OF COLORADO
STATE BUILDINGS AND REAL ESTATE PROGRAMS

100% Construction Documents
January 12, 2018

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SECTION 01 10 00 - SUMMARY

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:
   1. Project information.
   2. Work covered by Contract Documents.
   3. Work by University.
   4. Work under separate contracts.
   5. University-furnished and installed products.
   7. Access to site.
   8. Coordination with occupants.
   10. Specification and drawing conventions.

B. Related Requirements:
   1. Section 01 35 46 “Indoor Air Quality Procedures” for requirements and procedures related to maintaining air quality in adjacent occupied spaces and buildings.

1.3 PROJECT INFORMATION

A. Project Identification: The office of the Chancellor on the 14th floor of Lawrence Street Center is looking to expand by combining the existing Chancellor’s office with the adjacent office. The upgraded space is not undergoing any change in use, occupancy or occupancy numbers. All existing circulation and paths of circulation and egress remain the same.
   1. Project Location: 1250 14th Street, Denver, Colorado 80202

B. Principal Representation: University of Colorado Denver.
   1. University’s Representative: Kim Griffin


D. Architect/Engineer’s Consultants: The Architect/Engineer has retained the following design professionals who have prepared designated portions of the Contract Documents:
   1. Mechanical, Electrical and Plumbing Engineers: BG Buildingworks, 1626 Cole Blvd Bldg. 7, Ste #300 Lakewood, CO 80401, Phone: 303-278-3820, Contact: Mike Reed.
1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and, in summary, briefly consists of the following: The University is converting to existing classrooms on the first floor into an office and a meeting space for the new City Centre program. The upgraded space is not undergoing any change in use, occupancy or occupancy numbers. All existing circulation and paths of circulation and egress remain the same.

1.5 WORK BY UNIVERSITY

A. General: Cooperate fully with University so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by University. Coordinate the Work of this Contract with work performed by University. Work by the University will be installation of IT and Data wiring, coordination, delivery and installation of the furniture systems and furnishings.

1.6 WORK UNDER SEPARATE CONTRACTS

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.

1.7 UNIVERSITY-FURNISHED AND INSTALLED PRODUCTS

A. University will furnish certain items of equipment/furnishings as noted on the Drawings. Contractor will be responsible for coordinating their work to accommodate these items including, but not limited to, physical space fit, utility connections and rough-in, power wiring and electrical characteristics.

B. Include in Project scheduling the latest times when information for such items is required and so notify the University in writing.

1.8 UNIVERSITY-FURNISHED, CONTRACTOR-INSTALLED PRODUCTS

A. The University will furnish certain items delivered to the jobsite as shown on the drawings.

B. The Contractor will be responsible for coordinating their work to accommodate these items including, but not limited to, physical space fit, utility connections and rough-in, power wiring and electrical characteristics.

C. Include in Project scheduling the latest times when information for such items is required and so notify the University in writing.

D. Cooperate with University in scheduling the delivery of these items and be responsible for accommodating their storage and protection in the building and their replacement or repair due to damage as a result of Contractor’s operations.

1.9 ACCESS TO SITE

A. General: Contractor shall have limited and restricted use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Adjust means and methods of construction based on site limits and restrictions.
   2. Locate staging areas only where permitted by University.

C. Construction Access and Travel:
   1. Use only those entrances, exits, and travel ways on campus roads and within the building designated by University. Contractor's personnel are not permitted in non-designated areas of University's existing facilities. Use only designated travel ways for transporting demolition materials, new construction materials, tools and equipment.
   2. Use of other than designated travel ways on campus roads and within existing buildings requires a minimum of 20 business days prior approval by University.
      a. Request variations to traffic flow including temporary fire lane, parking lot, sidewalk and road closures, regulatory signage, and traffic control devices in accordance with City and County of Denver requirements.
   3. Access to the site will be as permitted by the University. Prearrange delivery and use of cranes, heavy trucks and other heavy equipment at least 72 hours prior to need through the University’s Project Manager and University Police.
   4. Maintain access to fire lanes and campus operations at all times. Provide flag personnel during the ingress or egress of large equipment.
      a. When fire lanes and/or access way must be temporarily disrupted notify University Police and University Parking and Transportation at least 20 business days in advance and reconfirm 72 hours in advance through the University’s Project Manager.
   5. Arrange for and obtain all necessary permits from City and County of Denver for any disruption to or temporary closures of public city streets. Coordinate procurement of permits with University Project Manager.

D. Construction Parking:
   1. General: Contractor parking will not be provided; make arrangements and pay for all required parking.
   2. Provide temporary parking or use designated areas of University’s existing parking areas as applicable to the Project and in accordance with the following:
      a. All parking on University property, including parking on University owned streets, is under the exclusive control and authority of University Parking and Transportation Services. Direct policy question to the department at (303) 724-2555.
      b. There is no free parking on campus. Displacement or use of existing parking spaces by Contractor, either for parking or for staging, is a Contractor cost.
      c. Use of existing parking spaces or other areas outside of Contractor’s staging area must be approved in advance by University Parking and Transportation Services.
      d. University Parking and Transportation Services may require and issue parking permits through the University Project Manager. Permits must be displayed and visible at all times while parked on the campus. Failure to display a permit will result in citations being written and possible removal of the vehicle from University property.
      e. Keep all designated parking areas clean and free of litter and debris. University reserves the right to direct Contractor to clean areas not kept clean and orderly.
      f. University Parking and Transportation Services may change parking assignments as deemed necessary, restrict the use of any space(s) or lot(s) at any time, and determine the hours of control and mode of operations for any parking area at any time. University Parking and Transportation Services may deny or revoke parking privileges to any person when deemed necessary and/or considered to be in the best interests of the University.
   3. Parking on University property is at the Contractor’s own risk. The University and any entity affiliated with it are not responsible for fire, theft, and damage to or loss of contractor’s or subcontractor’s vehicle or any article left therein. Only a license is granted to the user and no bailment is created.
E. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weather-tight condition throughout construction period. Repair damage caused by construction operations.

1.10 COORDINATION WITH OCCUPANTS

A. University may occupy site and both existing and adjacent floor(s) during entire construction period. Cooperate with University during construction and sequence operations to minimize conflicts and facilitate University usage. Perform the Work so as not to interfere with University's day-to-day operations.
  1. Maintain existing exits from existing and adjacent building, unless otherwise indicated.
  2. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from University and approval of authorities having jurisdiction.
  3. Limit construction operations to those methods and procedures which will not adversely and unduly affect the working environment of University's occupied spaces, including noise, dust, odors, air pollution, ambient discomfort, poor lighting, hazards and other undesirable effects and conditions.
  4. Coordinate with University Project Manager to schedule jack hammering or activities producing dusty conditions, excessive fumes or odors during off-hours.
  5. When work must be accomplished in areas containing existing furniture, upon a minimum of 3 business days notification of the University Project Manager, University will remove or relocate existing furniture.
  6. Provide not less than 72 hours' notice to University Project Manager of activities that will affect University's operations. University Project Manager will coordinate with campus tenants.
     a. Refer to “Work Restrictions” Article of this Section for procedures and notification requirements related to utility interruptions.
  7. Provide temporary barriers and partitions, or other means as required to protect occupants of existing building and the general public from injury due to construction activities. Prevent the spread of dust and dirt to adjacent occupied areas and building.

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.
  2. In planning and executing the Work, take into consideration the special needs of University patient care, teaching and research settings, for example, supply of critical utilities, noise and dust control, access to existing loading docks, occupied buildings, etc.

B. Normal Working Hours: Limit work to normal working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday with extended hours as approved by University Project Manager.
  1. Notify University Project Manager of all proposed work outside of normal working hours. Include dates, times, names and contact information for contractors and subcontractor performing the Work with notification. University Project Manager will notify, as appropriate, other University personnel and departments including, but not limited to, Building Maintenance and Operations (BMO) Directors, BMO assigned representative, Campus Police and Facilities Management.

C. Noise and Vibration: Coordinate operations that may result in high levels of noise and vibration, or other disruption to University occupancy with University.
  1. Noise during Normal Working Hours: Identify potentially disruptive construction activities at weekly Progress Meeting and adjust active time of day to reduce significant impacts on occupants.
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2. Noise outside Normal Working Hours: Schedule construction work or demolition work outside of normal working hours with University Project Manager at minimum of 24 hours in advance.
   a. The maximum permissible noise level is 75 decibels (dBA), measured at the adjacent property line.

D. Contractor Identification:
   1. Supervisory staff for the primary contractor must obtain an identification badge at the University Anschutz Medical Center (AMC) Building 500. Submit the University Access Control Badge Application form through University Project Manager. Submitted forms shall be complete with all required information including a letter on company letterhead confirming employee status with company and stating whether the company completes background testing and/or drug screening. Contractor supervision must display badge on site during construction activities.
   2. To the greatest extent possible, Contractor’s and subcontractor’s employees must wear a recognizable logo shirt or hardhat identifying them as members of the contractor’s work force.
   3. Work with University Project Manager and Building Maintenance and Operations staff to get identification badge activated.
   4. Work with University Project Manager and Building Maintenance and Operations staff to set up identification badge for access to construction areas secured by card reader.

E. Use of Existing Elevators: Use designated elevators only and protect finishes during transport. Elevators may not be used for transport of construction materials between 7:00am – 9:00am, 11:30am – 1:30pm, and from 3:00pm – 5:00pm.
   1. Do not block corridors, aisles, passageways or doors leading to elevator except as, and only to the extent approved by University Project Manager.

F. Keys: Submit written request to University Project Manager on University Key Request Form.
   1. To the extent the need for keys is demonstrated and required to complete the Work, University Project Manager will issue keys to Contractor.
   2. Contractor is responsible for all costs related to lost or non-returned keys.
   3. Electrical, mechanical and sensitive research space may require University escort in lieu of issuing keys.

G. Dock Deliveries: Notify University Project Manager and limit deliver time to a maximum of 20 minutes.

H. Existing Utility Interruptions: Do not interrupt water, sewer, plumbing, gas, steam, chilled water, oxygen, HVAC, electrical power, lighting, telephone and other related utilities serving facilities occupied by University without prior notice to and approval by the University. Coordinate and schedule interruptions in advance through the University Project Manager in strict conformance with University Utility Interruption/Outage Request Procedure.
   1. Form of Notice: University Utility Interruption and Start-up Request form.
   2. Time of Notice: Notice for major and minor outages as defined by the Utility Interruption/Outage Request Procedure is 8 business days for minor outages and 31 business days for major outages.

I. Fire Alarm and Fire Sprinkler Interruptions: When construction activities require interruption of fire alarm or fire sprinkler service, or when dust from construction activities is likely to cause accidental alarm, advise University Project Manager who will submit an interruption request.
   1. Form of Notice: University Fire Alarm/Sprinkler Disable Request Form.
   2. Time of Notice: Prior to noon on the day before the anticipated interruption.

J. Nonsmoking Campus: Smoking, chewing tobacco, and other related tobacco product use is not permitted at any location on campus except outside in designated areas.

K. University Policies Applying to All Contractors: Comply with University policies applying to contractors including drug policy, sexual harassment policy and tobacco free policy. Obtain copies of University policies from University Project Manager.
1. Controlled Substances: Use of tobacco products and other controlled substances on Project site and surrounding Campus is not permitted.

L. Designated Eating Areas: Restrict consumption of food on project site to designated eating areas as approved by University Project Manager.

1.12 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.
   3. Words in the singular number include the plural and those in the plural include the singular.
   4. Words of any gender include any other gender.

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 are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
   3. Keynoting: Materials and products may be 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 01 10 00
SECTION 01 23 00 - ALTERNATES

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 alternates.

1.3 DEFINITIONS
A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if University decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1.  Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2.  The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.
3.  Selection of alternates described in this Section may be deferred for possible selection at a subsequent date if so indicated in the Agreement.

1.4 PROCEDURES
A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1.  Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

1.  Alternate descriptions are recognized as abbreviated and incomplete. Correlate the descriptions with applicable Specification Sections and Drawings for the provision of complete and coordinated work.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES
   1. Provide one new floor box. Existing slab to be cored and saw cut as required for all conduit required to box as per electrical drawings.

END OF SECTION 01 23 00
SECTION 01 25 00 - SUBSTITUTION 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 substitutions.

B. Related Requirements:

1. Section 01 21 00 "Allowances" for products selected under an allowance, if applicable.
2. Section 01 23 00 "Alternates" for products selected under an alternate, if applicable.
3. Section 01 60 00 "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 University that are not required in order to meet other Project requirements but may offer advantage to Contractor or University.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit each request for consideration in format and quantities specified in Section 01 33 00 "Submittal Procedures". 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 or Contractor-generated form with substantially the same information.

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 University 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/Engineer's Action: If necessary, Architect/Engineer in consultation with the University will request additional information or documentation for evaluation within seven calendar days of receipt of a request for substitution. Architect/Engineer in consultation with the University will notify Contractor of acceptance or rejection of proposed substitution within 14 calendar days of receipt of request, or seven calendar days of receipt of additional information or documentation, whichever is later.

   a. Forms of Acceptance: Change Order.
   b. Use product specified if Architect/Engineer 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 14 calendar days prior to time required for preparation and review of related submittals.

1. Conditions: Architect/Engineer in consultation with the University will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect/Engineer 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. Requested substitution provides sustainable design characteristics that specified product provided.
   c. Substitution request is fully documented and properly submitted.
   d. Requested substitution will not adversely affect Contractor's construction schedule.
   e. Requested substitution has received necessary approvals of authorities having jurisdiction.
   f. Requested substitution is compatible with other portions of the Work.
   g. Requested substitution has been coordinated with other portions of the Work.
   h. Requested substitution provides specified warranty.
   i. 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: Not allowed.

PART 3 - EXECUTION (Not Used)
SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 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 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
      2. Contractor’s Agreement Design/Bid/Build, State Form SC-6.21 and The General Conditions of the Construction Contract Design/Bid/Build, State Form SC-6.23 for definitions and contractual requirements related to contract modification procedures.

1.3 DEFINITIONS
   A. Change Order: A written order in compliance with the requirements of the Contract authorizing changes in the Work. For the purposes of this Section a Change Order and a Contract Amendment shall have the same meaning.

1.4 INFORMATIONAL SUBMITTALS
   A. Contractor’s Authorized Signatory: Submit name of individual authorized to accept changes and responsible for informing others employed by Contractor of changes in the Work.

1.5 MINOR CHANGES IN THE WORK
   A. Architect/Engineer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.6 CHANGE ORDER BULLETIN
   A. University-Initiated Change Order Bulletin: Architect/Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications. It will also state the time period for which the request will remain valid.
2. Work Change Order Bulletins issued by Architect/Engineer are not instructions either to stop work in progress or to execute the proposed change.

B. Contractor-Initiated Change Order Bulletin: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect/Engineer.

2. 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.

1.7 CHANGE ORDER PROPOSAL

A. Change Order Proposal: In response to a University-Initiated Change Order Bulletin or accompanying a Contractor-Initiated Change Order Bulletin, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change described.

2. Labor Rates: Prior to submitting first Change Order Proposal, submit bare, unburdened hourly labor rates for all contractor and subcontractor labor categories; submit itemized breakdown of all applicable additional labor benefit costs to be added to the bare labor cost to arrive at the total burdened hourly labor cost.
3. Equipment Costs: Provide cost backup for all equipment clearly indicating equipment billing rates and sufficient to demonstrate, as determined by the University Project Manager, that proposed rates are competitive and reasonable in all cases. Submit completed Change Order Proposal Form within the requested timeframe. Include backup documentation to support calculations consistent with Contract provisions, including but not limited to, the following:

a. Contractor and Subcontractor labor, material and equipment costs including:

1) 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.
2) Applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
3) Costs of labor and supervision directly attributable to the change and as permitted by the terms and conditions of the General Contract for Construction.

b. Contractor and Subcontractor overhead and profit.
c. Contractor’s bond cost.
d. Justification for Change in Contract Time: 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.
4. Maintain detailed records of work completed. Provide complete information for evaluation of proposed changes and to substantiate proposed changes in Contract Sum or Contract Time.
1.8 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 01 21 00 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

B. Unit-Price Adjustment: See Section 01 22 00 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.9 CHANGE ORDER PROCEDURES

A. Submit three signed copies of Change Order Proposal to Architect/Engineer for review.

1. University-Initiated Change Order Bulletins: University and Architect/Engineer will evaluate Contractor’s Change Order Proposal and either request additional information or suggest modifications. Based on this review and evaluation University will either accept or reject the proposal.

2. Contractor-Initiated Change Order Bulletins: Architect/Engineer will evaluate Contractor’s claim based on the terms and conditions of the Contractor Agreement and General Conditions of the Construction Contract, as applicable.

3. Architect/Engineer’s Action: When satisfied as to the accuracy and completeness of the Change Order Proposal, the Architect/Engineer will sign all three copies and forward to the University for consideration.

B. On University’s approval of a Change Order Proposal, Architect/Engineer will prepare, sign and forward three copies of a Change Order, State Form SC-6.31 available from the website of the Office of the State Architect, for signature by the Contractor. Contractor then forwards all three copies of signed Change Order to the University for signature and distribution of fully executed copies to Architect/Engineer and Contractor for record.

C. Upon receipt of a fully executed Change Order, promptly perform the following:

1. Revise Schedule of Values on the Application for Payment Form by indicating each authorized Change Order as a separate line item and adjusting the Contract Sum as shown on the Change Order.

   a. University will not pay for changes to the Work until authorized by a Change Order signed by all parties.

2. Revise the Progress Schedule to reflect any change in the Contract Time.

3. Enter changes in the Project Record Documents.

END OF SECTION 01 26 00
SECTION 01 29 00 - 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 01 21 00 "Allowances" for procedural requirements governing the handling and processing of allowances.
2. Section 01 22 00 "Unit Prices" for administrative requirements governing the use of unit prices.
3. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
4. Section 01 32 00 "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. Schedule of values report from cost-loaded Critical Path Method Schedule prepared in accordance with Section 01 32 00 “Construction Progress Documentation” may serve to satisfy requirements for the schedule of values.

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. Items required to be indicated as separate activities in Contractor's construction schedule.

1) Construction Manager’s Fee.
2) Estimated Project General Conditions Costs.

2. Submit schedule of values and hold a conference with the Architect/Engineer and University Project Manager to finalize the schedule of values at earliest possible date, but no later than 10
business days before the date scheduled for submittal of initial Certificates and Applications for Payment.

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/Engineer.
   c. Architect/Engineer'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.


4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

6. 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 a direct cost of actual work-in-place shall be shown as separate line items in the schedule of values.

7. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders result in a change in the Contract Sum.

1.5 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/Engineer and paid for by University.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Pay Application and Schedule Review Meetings: Conduct in accordance with Section 01 31 00 “Project Management and Coordination.” Provide draft application for payment and draft schedule update reflecting work accomplished during previous pay period. Review progress achieved; discuss and resolve issues affecting the progress; and review critical activities to be accomplished during the following 90 calendar days.

1. Jobsite Walk: When required, conduct a walk of the jobsite to confirm progress related to any activity in question.
C. Monthly Schedule Reporting: Upon conclusion of the Pay Application and Schedule Review Meeting, but not later than the 28th of the month, update the Construction Schedule and submit the Pay Application.

D. Payment Application Times: Submit Application for Payment to Architect/Engineer by the first day of the month and no more than five (5) business days prior there to. The period covered by each Application for Payment is per the date indicated in the Application.

E. Payment Application Review: The Architect/Engineer shall, within five (5) business days after the receipt of each Certificate and Application for Payment, review the Project Application for Payment and either execute a Project Certificate for Payment to the University or notify the Contractor in writing of the reasons for withholding a Certificate.

1. All applications for payment, except the final application, and the payments there under, shall be subject to correction in the next application rendered following the discovery of any error.

F. Application for Payment Forms: Use State Form SBP-7.2 “Certification for Contractor Payment.”

G. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect/Engineer will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under University-requested project acceleration.

H. Stored Materials: 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 as approved in advance by the University Project Manager and items stored at an off-site location previously agreed upon in writing.

1. Provide certificate of insurance, evidence of transfer of title to University, 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.

I. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect/Engineer by a method ensuring receipt. 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.

J. 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. For projects required to obtain LEED certification, LEED submittal for project materials cost data.
4. Contractor's construction schedule (preliminary if not final).
5. Products list (preliminary if not final).
6. For projects required to obtain LEED certification, LEED action plans.
7. Schedule of unit prices.
8. Submittal schedule (preliminary if not final).
9. List of Contractor's staff assignments.
10. List of Contractor's principal consultants.
13. Initial progress report.

K. Application for Payment at Substantial Completion: After Architect/Engineer 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. This application shall reflect Certificate(s) of Substantial Completion issued previously for University occupancy of designated portions of the Work.

L. 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. All items on Pre-acceptance Checklist (State Form SBP-05) have been completed.
2. Notice of Acceptance (State Form SBP-6.27) has been issued.
3. Statements to support local sales tax refunds, if any submitted.
4. Notice of Contractor’s settlement has been published.
5. Evidence of completion of Project closeout requirements, including but not limited to:
   a. Submittal of Record Documents.
   b. Submittal of all Operation and Maintenance Manuals.
   c. Completion of all required demonstration and training.
6. Updated final statement, accounting for final changes to the Contract Sum.
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 University took possession of and assumed responsibility for corresponding elements of the Work.
CU Denver Building Convert Room 1110 & 1120 to City Center
University of Colorado Denver

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00
SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 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 Web site.
   5. Project meetings.

B. Related Requirements:
   1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   2. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking information required by or clarifications of the Contract Documents.

1.4 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. Within 21 calendar days of Notice of Award submit, as complete as possible, a preliminary list to include all major subcontractors. Augment, complete and submit the final subcontractor list within 60 calendar days of Notice of Award, unless a longer duration is approved by the Architect/Engineer. 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 14 calendar days after Notice to Proceed, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home,
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.

1.5 GENERAL COORDINATION PROCEDURES

A. General: Each entity involved in the performance of work for the entire Project shall cooperate in the overall coordination of the Work; promptly, when requested, furnish information concerning its portion of the Work; and respond promptly and reasonably to the decisions and requests of persons designated with coordination, supervision, administrative or similar authority.

1. University Standard Project Management Forms

a. Where applicable, obtain from the University Project Manager and use the following University Standard Forms:

1) Preconstruction Agenda
2) Change Order Log with Contingency Codes
3) Access Control Badge Application Form
4) Utility Interruption Request Form
5) Utility Start-Up Request Form
6) Fire Alarm/Sprinkler Disable Request Form
7) Hot Work Permit Form
8) Anschutz Medical Campus (AMC) Street and Parking Lot Closure Form
9) Indoor Air Quality (IAQ) Planning Checklist
10) Indoor Air Quality (IAQ) Inspection Checklist

2. Site Utilization:

a. In addition to the site utilization limitations and requirements indicated in Section 01 10 00 “Summary” and indicated by the Contract Documents; administer the allocation of available space equitably among entities needing access and space, so as to produce the best overall efficiency in the performance of the total work of the project. Schedule deliveries so as to minimize the space and time requirements for storage of materials and equipment on the site; but do not unduly risk delays in the work.

b. Concurrent with work of the Contractor, other contractors, suppliers, and the University personnel may be working in relatively close proximity. The Contractor is solely responsible for coordinating their work with that of other contractors and will make no claims for failure to do so.

3. Layout:

a. It is recognized that the Contract Documents are diagrammatic in showing certain physical relationships of the various elements and systems and their interfacing with other elements and systems. Establishment and coordination of these relationships is the exclusive responsibility of the Contractor. Do not scale the drawings. Lay out and arrange all elements to contribute to safety, efficiency and to carry the harmony of design throughout the Work. In case of conflict or undimensioned locations, verify required positioning with Architect/Engineer.

4. Substrate Examination:

a. The Installer of each element of the work must examine the conditions of the substrate to receive the work, dimensions and spaces adjacent, tolerances, interfacing with other elements and services, and the conditions under which the work will be performed, and
must notify the Contractor in writing of conditions detrimental to the proper or timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

5. Large and Heavy Equipment:
   a. Contractor to coordinate with University Project Manager requirements to be maintained for the subsequent entry of large equipment units. Coordinate the movement of heavy items with shoring and bracing, so that the building structure will not be overloaded during the movement and installation.
   b. Where equipment or products to be installed on the roof are too heavy to be hand-carried, do not transport across roof deck; position by crane or other device so as to avoid overloading the roof deck.

B. 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 of the Specification that depend on each other for proper installation, connection, and operation.

1. Contractor Communication with the University: Direct all communication with the University through the University Project Manager.
2. 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.
3. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
4. Make adequate provisions to accommodate items scheduled for later installation.

C. 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 University and separate contractors if coordination of their Work is required.

D. 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.

E. Coordination Of Submittals: Prior to transmittal to the Architect/Engineer, review shop and erection drawings, product data, and samples for compliance with Contract Documents and for coordination among work of all Sections of the Specifications. Coordination of submittals shall include, but not be limited to the following:

1. Verification of field dimensions and clearances and relationship to available space and anchors.
2. Verification of compatibility with equipment and work of other Sections, electrical characteristics, and operational control requirements.
3. Verification of motor voltages and control characteristics.
4. Coordination of controls, interlocks, wiring of pneumatic switches, and relays.
5. Coordination of wiring and control diagrams.
6. Review of the effect of any changes on work of other Sections.
7. For any item to be installed in or on a finished surface, certify that applicable Contract Documents have been checked and that the item submitted is compatible with the surface finish on which it is to be installed.
8. Equipment and material submittals shall show sufficient data to indicate complete compliance with Contract Documents as follows:
   a. Proper sizes and capabilities.
   b. Ability to fit in the available space in a manner that will allow proper service.
   c. Construction methods, materials, and finishes.
   d. List of accessories.

F. Special Coordination Requirements for Mechanical and Electrical Work:

1. General: Provide necessary work and services required to coordinate the complete installation of heating, ventilating, and air conditioning (HVAC) equipment and systems; plumbing systems and fixtures; electrical equipment, fixtures, and systems; and other equipment or systems containing motors and controls or requiring connection to mechanical or electrical systems; all so that the various systems perform as indicated and are in harmony with other project Work.
2. Contract Drawings:
   a. Drawings are schematic in nature, and indicate in general how the various components are integrated with other parts of the building. Coordinate exact locations by job measurement, by verifying the requirements of other trades, and by review of Contract Documents.
3. Mechanical and Electrical Drawings indicate general routing of the various parts of the systems, but do not indicate all sizes, fittings, offsets, and runouts which are required. Coordinate correct sizes, fittings, offsets, and runouts required to fit systems into allocated spaces. Coordinate locations of all light fixtures, vents, and supply grilles to conform to the ceiling grid system or other modular finishes.
4. Coordinate installation of mechanical and electrical work in compliance with the following requirements:
   a. Install piping, ductwork and similar services straight and true, aligned with other work, close to walls and overhead structure, allowing for insulation, concealed (except where indicated as exposed) in occupied spaces, and out-of-the-way with maximum passageway and headroom remaining in each space.
   b. Install electrical work in a neat, organized manner with conduit and similar services in or parallel with building lines, and concealed unless indicated as exposed.
   c. For all work maintain maximum practical overhead clearance but not less than 6” above ceiling. Where exposed, maintain 7’-0” minimum clearance.
   d. Arrange all work to facilitate maintenance and repair or replacement of equipment. Locate services requiring maintenance on valves and similar units in front of services requiring less maintenance. Connect equipment for ease of disconnecting, with minimum of interference with other work.
   e. Provide space to permit removal of coils, tubes, fan shafts, filters, other parts which may require replacement.
   f. Locate operating and control equipment and devices for easy access. Furnish access panels where units are concealed by finishes and similar work.
   g. Integrate mechanical work in ceiling plenums with suspension system, light fixtures and other work, so that required performances of each will be achieved.
   h. Give the right-of-way to piping systems required to slope for drainage over other service lines and ductwork.
i. Advise other trades of openings required in their work for accommodation of mechanical and electrical elements. Provide and place sleeves and anchors required in other work.

5. Access to Equipment: Except where located above accessible ceilings, provide access panels wherever access is required to concealed valves, controls, dampers, pull boxes and other devices requiring ongoing or periodic access.
   
a. Acceptable types of access panels are specified in Division 08.
b. Each trade is responsible for providing access panels needed for access to their equipment and coordinating installation with other Division 03, 04, 06 and 09 trades.
c. Coordinate requirements and obtain approval of locations from Architect/Engineer.

G. Compatibility of Systems:

1. Provide products and equipment which are compatible with other work requiring mechanical/electrical interface including electrical connections, control devices, water, drain and other piping connections. Verify electrical characteristics, fuel requirements and other interface requirements before ordering equipment and resolve conflicts that may arise.

2. Coordinate equipment, mechanical and electrical work in accordance with the following schedule:

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<thead>
<tr>
<th>ITEM</th>
<th>FURNISHED BY</th>
<th>MOUNTED BY</th>
<th>LOW VOLTAGE WIRED BY</th>
<th>POWER WIRED &amp; CONNECTED BY</th>
<th>LOW VOLTAGE CONTROL CONNECTED BY</th>
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<tbody>
<tr>
<td>Equipment motors</td>
<td>I</td>
<td>MI</td>
<td>MI</td>
<td>EI</td>
<td>--</td>
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<tr>
<td>Motor starters, contactors and overload heaters</td>
<td>MI</td>
<td>EI</td>
<td>EI</td>
<td>EI</td>
<td>MI</td>
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<tr>
<td>Fused and unfused disconnect switches</td>
<td>EI**</td>
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<td>Manual operating switches, speed switches, push-button stations and pilot lights</td>
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<td>EI</td>
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<tr>
<td>Duct detectors</td>
<td>EI</td>
<td>MI</td>
<td>MI</td>
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<td>MI</td>
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<tr>
<td>Control relays and transformers</td>
<td>MI</td>
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<td>MI</td>
<td>EI</td>
<td>MI</td>
</tr>
<tr>
<td>Thermostats, time switches*</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
<td>EI</td>
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<td>Temperature control panels</td>
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<td>EI</td>
<td>MI</td>
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<tr>
<td>Motor and solenoid valves, damper motors, PE and EP switches</td>
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<td>MI</td>
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<tr>
<td>Refrigeration equipment, cooling tower and controls</td>
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<td>Electric meters</td>
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<td>Steam meters</td>
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<td>Chilled water meters,</td>
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<td>Water meters</td>
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**Natural Gas**

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</table>

I = Installer of equipment requiring electrical service  
EI = Electrical Installer  
MI = Mechanical Installer

* Motor driven units which are controlled from line voltage automatic controls such as line voltage thermostats, float switches or time switches which conduct full load current of the motor shall be wired for both power and control circuit under the electrical contract. However, if the control device does not conduct full load current, then the responsibility shall be that set forth in the above schedule. (Example: a 208 volt, 3-phase, 3-wire motor requires 120 volt control. Electrical Installer shall furnish a 120 volt circuit for control and 208 volt circuit for power and wire the power circuit. Mechanical Installer shall wire the control circuit.)

** Disconnects for AH units are factory mounted.

***Building Service meter provided by Civil. Any sub meter provided by MI. Coordinate meter requirements with utility for remote monitoring by 23 09 00 – Instrumentation and Controls.

H. Special Coordination Requirements for Exterior Envelope Work:

1. General: Provide necessary work and services required to coordinate the complete and continuous installation of the building’s heat, air and moisture barriers. Exterior building envelope construction to be coordinated includes, but is not limited to, below-grade walls, slabs-on-grade, exterior opaque walls, windows, curtain walls, roofs, and skylights.

2. Contract Drawings:
   a. Drawings indicate general concepts and design intent for continuity of heat, air and moisture barriers at each exterior building envelope component and at transitions between building envelope components. Coordinate details for continuity based on actual product selections and Contractor’s proposed sequence of construction.

I. Complete Systems:

1. It is the intent of the Contract Documents that all systems, including mechanical and electrical, be complete and functional to provide the intended or specified performance. Provide all incidental items and parts necessary to achieve this requirement.

2. Provide correctly sized power, utilities, piping, drains, services and their connections to equipment and systems requiring them, whether or not specific items are listed in the schedule under “Compatibility of Systems” paragraph in this Section.

J. 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. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as University's property.

2. Establish recycling program at job site. Refer to Section 01 74 19 “Construction Waste Management and Disposal” for additional requirements.
1.6 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. Coordinate the addition of trade-specific information to the coordination drawings by multiple subcontractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
   c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
   e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
   f. Indicate required installation sequences.
   g. 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/Engineer indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings, where required, to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

   a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
   b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
   c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:
a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection System: Show the following:
   a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Windows, Curtain Wall, and Exterior Wall Assembly Transition Work: Show all components of each adjacent wall or window system and all required compatible tie-ins between them including transition strips, flashings and sealants. Clearly identify each product, its configuration and its extent. Shop Drawings which only generically indicate adjacent construction and/or indicate “construction by others” will not be acceptable.

10. Review: Architect/Engineer will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect/Engineer determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect/Engineer will so inform Contractor, who shall make changes as directed and resubmit.

11. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 00 "Submittal Procedures."

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect/Engineer will return RFIs submitted to Architect/Engineer by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect/Engineer.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.


C. RFI Forms: Hard copy form or software-generated form with substantially the same content as indicated above, acceptable to Architect/Engineer.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect/Engineer's Action: Architect/Engineer will review each RFI, determine action required, and respond. Allow seven calendar days for Architect/Engineer's response for each RFI. RFIs received by Architect/Engineer after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:
   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for approval of Contractor's means and methods.
   d. Requests for coordination information already indicated in the Contract Documents.
   e. Requests for adjustments in the Contract Time or the Contract Sum.
   f. Requests for interpretation of Architect/Engineer's actions on submittals.
   g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect/Engineer's action may include a request for additional information, in which case Architect/Engineer's time for response will date from time of receipt of additional information.

3. Architect/Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Contractor-Initiated Change Order Bulletin and Proposal according to Section 01 26 00 "Contract Modification Procedures."
   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect/Engineer in writing within seven calendar days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by RFI number. Submit log weekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect/Engineer.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect/Engineer's response was received.

F. On receipt of Architect/Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect/Engineer within seven calendar days if Contractor disagrees with response.

1.8 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 University and Architect/Engineer of scheduled meeting dates and times a minimum of 4 business days prior to meeting.
   a. Participants, including representatives of subcontractors and suppliers, shall be qualified, familiar with Project and authorized to conclude matters relating to the Work.

2. **Agenda:** Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. **Minutes:** Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including University and Architect/Engineer, within three business days of the meeting.

B. **Preconstruction Conference:** Schedule and conduct a preconstruction conference before starting construction, at a time and site convenient to all parties, but not later than 14 calendar days after Notice to Proceed.

1. Conduct the conference to review responsibilities and personnel assignments.
2. **Attendees:** Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work and include the following:
   a. **Authorized representatives of University:**
      1) University Project Manager.
      2) University Building Maintenance Operations (BMO) Representative.
   b. Architect/Engineer and their consultants.
   c. Contractor’s project manager and superintendent.
   d. Major subcontractors and suppliers.
   e. Other concerned parties shall attend the conference.

3. **Agenda:** Discuss items of significance that could affect progress, including the following:
   a. Designation of key personnel and their duties.
   b. Lines of communications.
   c. List of major subcontractors and suppliers.
   d. Tentative construction schedule.
      1) Phasing.
      2) Critical work sequencing and long-lead items.
      3) Equipment deliveries and priorities.
   e. Procedures and processing of:
      2) RFI’s
      3) Testing and inspecting.
      4) Applications for Payment.
      5) Submittals.
      6) Preparation of record documents.
   f. Use of the premises, existing building and adjacent buildings as applicable.
      1) Work restrictions.
      2) Working hours.
      3) University's occupancy requirements.
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4) Procedures for disruptions and shutdowns.
5) Construction parking and staging.
6) Construction route and site access.
7) Office, work, and storage areas.
8) Progress cleaning and housekeeping procedures.

g. Project coordination.
h. Distribution of the Contract Documents.
i. Temporary facilities and controls.
j. Indoor Air Quality Plan and Monitoring including procedures for moisture and mold control.
k. Construction waste management and recycling.
l. Safety.

1) Fire and Life Safety.
2) Health and Safety.

m. First aid.
n. Security.
o. Building Department.
p. Telecommunications.
q. Building Services.
r. Building Operations.
s. University Work Related Policies.
t. Contractor Contacts.
u. University Contacts.
v. University Process Forms.

1) Key Request Form.
2) Access Control Badge Application Form.
3) Utility Interruption Request Form.
4) Utility Start-Up Form.
5) Fire Alarm/ Sprinkler Disable Request Form.
6) Hot Work Permit Form.
7) Anschutz Medical Campus (AMC) Street and Parking Lot Closure Form.
8) Indoor Air Quality (IAQ) Plan.
9) IAQ Planning Checklist.
10) IAQ Inspection Checklist.
11) Request for Variance.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site for installations, systems or assemblies where required by individual Specification Sections, or where deemed necessary by Contractor.

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/Engineer of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following, as appropriate:

   b. Options.
   c. Related RFI's.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. LEED requirements, for projects pursuing LEED certification.
i. Review of mockups.
j. Possible conflicts.
k. Compatibility requirements.
l. Time schedules.
m. Weather limitations.
n. Manufacturer's written instructions.
o. Warranty requirements.
q. Acceptability of substrates.
r. Temporary facilities and controls.
s. Space and access limitations.
t. Regulations of authorities having jurisdiction.
u. Testing and inspecting requirements.
v. Installation procedures.
w. Coordination with other work.
x. Required performance results.
y. Protection of adjacent work.
z. Protection of construction and personnel.

3. Record significant conference discussions, approved schedules, 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, including University Project Manager and Architect/Engineer.

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 University and Architect/Engineer, but no later than 30 calendar days prior to the scheduled date of Substantial Completion or Partial Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.

2. Attendees: Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work and include the following:

   a. University Project Manager.
   c. Architect/Engineer and their consultants.
   d. Contractor’s project manager and superintendent.
   e. Major subcontractors and suppliers.
   f. Other concerned parties.

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

   a. Procedures related to:

      1) Notice of Completion, including preparation of Contractor’s punch list.
      2) Final Inspection.
      3) Notice of Substantial Completion.
      4) Notice of Approval of Occupancy/Use.
5) Supplemental Occupancy/Use Checklist.
6) Supplemental Acceptance Checklist.
7) Pre-acceptance Checklists.
8) Notice of Acceptance.
9) Settlement and Final Payment.

b. Preparation of record documents.
c. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
d. Submittal of written warranties.
e. Requirements for completing LEED documentation, for projects pursuing LEED certification.
f. Requirements for preparing operations and maintenance data.
g. Requirements for delivery of material samples, attic stock, and spare parts.
h. Requirements for demonstration and training.
i. University's partial occupancy requirements.
j. Installation of University's furniture, fixtures, and equipment.
k. 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.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work and include the following:
   a. University Project Manager.
b. University Health Safety Department Representative.
d. University Campus Building Official.
e. Architect/Engineer and their consultants.
f. Contractor’s project manager and superintendent.
g. Major subcontractors and suppliers.
h. Other entities concerned with current progress or involved in planning, coordination, or performance of future activities.
i. As needed, University Building Maintenance Operations (BMO), Subject Matter Experts (SME), and University Facility Support Services (FSS) Representatives.

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:
   1) Review progress since the last meeting.
   2) Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule.
   3) 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.
   4) Review schedule for next two week period.
   5) Review schedule of deliveries.
   6) Review off-site fabrication.
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b. Site Safety.
c. Indoor Air Quality Management monitoring.
d. Quality:
   1) Quality and work standards.
   2) Status of correction of deficient items.
   3) Progress cleaning.
   4) Field observations.
e. Status of submittals.
f. Status of RFI's.
g. Status of Changes including:
   1) Change Order Bulletins.
   2) Change Order Proposals.
   3) Change Orders.
   4) Pending claims and disputes.

h. Status of LEED documentation, for projects pursuing LEED certification.

i. Review present and future needs of each entity present including:
   1) Access.
   2) Site utilization.
   3) Temporary facilities and controls.
   4) Coordination.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

F. Pay Application and Schedule Review Meeting: Conduct review meeting monthly on or about the 25th of each month.

1. Attendees:
   a. University Project Manager.
   b. Architect/Engineer.
   c. Contractor’s Project Manager, Superintendent and Scheduler.

2. Agenda: Review draft pay application and progress schedule update in accordance with the requirements of Section 01 29 00 “Payment Procedures” and Section 01 32 00 “Construction Progress Documentation.”

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00
SECTION 01 32 00 - CONSTRUCTION PROGRESS 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 documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Monthly project status reports.
6. Material location reports.
7. Site condition reports.
8. Special reports.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
2. Section 01 40 00 "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. 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.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.
1. Float time is not for the exclusive use or benefit of either University 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.

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 and four paper copies.

B. Startup construction schedule (bar chart).
   1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Contractor’s Preliminary Schedule and Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Detailed 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.

E. Construction Schedule Updating Reports: Submit draft for discussion at monthly project schedule and pay application review meeting. Submit final report with monthly Application for Payment.

F. Daily Construction Reports: Submit at weekly intervals.

G. Material Location Reports: Submit at monthly intervals.

H. Site Condition Reports: Submit at time of discovery of differing conditions.

I. 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 commencement of the Work to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date is not permitted. Contract completion date may only be modified by Change Order.

B. Activities: 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 21 calendar days, unless specifically allowed by Architect/Engineer.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 calendar days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include adequate time for startup, testing and commissioning.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect/Engineer's administrative procedures necessary for issuing Notice of Substantial Completion.

C. Constraints: Include the following constraints and work restrictions as indicated in the Contract Documents and as applicable in schedule; show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work by University: Include a separate activity for each portion of the Work performed by University.
3. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
4. University-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Work Restrictions: Show the effect of the following items, as applicable, on the schedule:

   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Partial occupancy before Substantial Completion.
   e. Use of premises restrictions.
   f. Environmental control.

6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

   a. Submittals.
b. Mockups.
c. Fabrication.
d. Sample testing.
e. Deliveries.
f. Installation.
g. Tests and inspections.
h. Building flush-out.
i. Startup and placement into final use and operation.

7. Construction Areas: As applicable, 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, Commencement of Work, Substantial Completion, Notice of Occupancy and Use, and Final Acceptance. As applicable, also include milestones for Partial Substantial Completion and Partial Notice of Occupancy and Use.

E. 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.

F. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules and as approved by University and Architect/Engineer.

2.2 REPORTS

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

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.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial completions and occupancies.
18. Substantial Completions authorized.

19. Narrative of progress achieved in previous month, activities anticipated for the next month, and issues affecting the rate of progress.
20. Progress photographs in accordance with Section 01 32 33 “Photographic Documentation.”

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.

2.3 SPECIAL REPORTS

A. General: Submit special reports directly to University within one calendar day(s) 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 University in advance when these events are known or predictable.

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 draft update schedule for discussion and review at monthly project progress schedule and pay application review meeting.

1. Revise schedule immediately after each meeting and issue updated schedule concurrently with submittal of monthly Application for Payment.
2. Include summary reports 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.
4. Schedule updates may change logic but may not change milestone or critical path without prior approval of University and Architect/Engineer.

B. Distribution: Distribute copies of approved schedule to Architect/Engineer University, 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 01 32 00
SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Division 02 through 33 for additional submittal requirements specific to indicated Specification Sections.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect/Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals." Submittals not specifically indicated as informational submittals are considered to be action submittals.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect/Engineer'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’ and include, but are not limited to:

1. Schedules.
2. Permits.
3. Applications for payment.
4. Performance and payment bonds.
5. Insurance certificates.
7. Schedule of Values.
8. Inspection and test results.
10. Coordination drawings.


1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a 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 revisions to submittals noted by Architect/Engineer 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 startup construction schedule and within 30 calendar days of Notice to Proceed or Commencement of Work, but not later than submittal of first application for payment. Include submittals required during the first 90 calendar 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 resubmittal.
g. Scheduled date for Architect/Engineer's final release or approval.
h. Scheduled date of fabrication.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect/Engineer's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect/Engineer for Contractor's use in preparing submittals.

1. Architect/Engineer will 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/Engineer 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 AutoCad format
c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to University and Architect/Engineer.
B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit for review with sufficient time to avoid construction delays.

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/Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect/Engineer'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 14 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect/Engineer 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 14 calendar days for review of each resubmittal.
4. Large and/or Complex Submittals: For large and/or complex submittals, as determined by the Architect/Engineer and for submittals that require sequential reviews by Architect/Engineer’s consultants, a review period greater than 14 calendar days may be required. Architect/Engineer and Contractor shall identify such submittals upon submission of the submittal schedule and determine a mutually agreed upon review period.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form 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 dash and then a sequential number (e.g., LNHS-061000-01). Resubmittals shall include an alphabetic suffix after another dash (e.g., LNHS-061000-01-A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect/Engineer.
   a. Project name.
   b. Date.
   c. Name and address of Architect/Engineer.
   d. Name and address of Contractor.
   e. Name of firm or entity that prepared submittal.
   f. Names of subcontractor, manufacturer, and supplier.
   g. Category and type of submittal.
   h. Submittal purpose and description.
   i. Specification Section number and title.
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j. Specification paragraph number or drawing designation and generic name for each of multiple items.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Related physical samples submitted directly.
n. Indication of full or partial submittal.
o. Transmittal number.
p. Submittal and transmittal distribution record.
q. Other necessary identification.
r. Contractor's certification that information complies with Contract Document requirements.
s. Remarks.

e. Options: Identify options requiring selection by Architect/Engineer.
f. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect/Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
g. Contractor Certification: On transmittal include Contractor's certification that information complies with Contract Document requirements.
h. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect/Engineer's action stamp.
i. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
j. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect/Engineer's action stamp.
k. Record Documents: Retain complete additional copies of submittals on Project site to be submitted as record documents in accordance with requirements of Section 01 78 39 “Project Record Documents.”
l. Legibility: Provide clear and legible submittals. Submittals that are blurry or are for any reason unreadable will be returned without action.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

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

1. Action Submittals: Submit three paper copies of each submittal to Architect/Engineer and one to University unless otherwise indicated. Architect/Engineer will return one copy.
2. Informational Submittals: Submit two paper copies of each submittal to Architect/Engineer and one to University unless otherwise indicated. Architect/Engineer will not return copies.
3. 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.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Manufacturer's installation instructions.
   d. Manufacturer's printed recommendations.
   e. Standard color charts.
   f. Statement of compliance with specified referenced standards.
   g. Statement of compliance with specified trade association standards.
   h. Testing by recognized testing agency.
   i. Application of testing agency labels and seals.
   j. Notation of coordination requirements.
   k. Notation of dimensions verified by field measurement.

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. Rough-in diagrams and templates indicating clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
7. Submit additional copies of Product Data as required complying with requirements of Section 01 78 39 “Project Record Documents.”

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Highlight, encircle or otherwise indicate deviations from Contract Documents. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect/Engineer’s digital data drawing files is otherwise permitted. Standard information prepared without specific reference to the Project is not considered a shop drawing.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   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. **Sheet Size:** Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than size of Construction Drawings.

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. Mount, display or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Architect/Engineer's Sample.
3. **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. Specification paragraph number and generic name of each item.
   f. Compliance with recognized standards.
   g. Availability and delivery time.

4. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

5. **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(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect/Engineer will return submittal with options selected.

6. **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/Engineer will retain two Sample sets; 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.

7. **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 University's property, are the property of Contractor.

8. Distribution of Samples: Prepare and distribute additional sets to Subcontractors, manufacturers, fabricators, suppliers, Installers, and others as required for performance of the Work. Show distribution on transmittal forms.

9. Field Samples and Mock-Ups: Field Samples and mock-ups specified in individual Sections are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the Work will be judged.

E. Selection of Related Materials: Where selections of colors, patterns, textures are specified to be made by Architect/Engineer, assemble complete samples of all specified or approved products for all Specification Sections and submit to Architect/Engineer. Review specifications and assemble all such samples for a combined single submittal. Indicate on the transmittal the latest date for selections to be made for each item to permit delivery of material in accordance with Progress Schedule. Architect/Engineer's action is limited solely to the specified selections or rejection of submittal items not in accordance with Specifications.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 40 00 "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 "Closeout Procedures."

K. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."

L. LEED Submittals: For project required to obtain LEED certification, comply with requirements specified in Division 01 Section "Sustainable Design Requirements".

M. Qualification Data: Prepare written information 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.

N. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

O. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
P. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

Q. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

R. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

S. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

T. Product Test Reports: Submit written reports indicating that 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.

U. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

V. Preconstruction Test Reports: Submit 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.

W. Compatibility Test Reports: Submit 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.

X. Field Test Reports: Submit written 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.

Y. Design Data: Prepare and submit 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.
PART 3 - EXECUTION

3.1 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 submitting to Architect/Engineer. Submittals received without Contractor’s substantive review and approval stamp will be rejected and returned to the Contractor.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 77 00 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT/ENGINEER’S ACTION

A. Action Submittals: Architect/Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect/Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Architect/Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect/Engineer will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect/Engineer.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect/Engineer without action.

END OF SECTION 01 33 00
SECTION 01 35 46 - INDOOR AIR QUALITY 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 managing emissions and moisture control during construction.

1.3 DEFINITIONS

A. Sustainable Design Related Terminology: As defined is ASTM E2114.

B. Adequate Ventilation: Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of particulates, dust, fumes, vapors, or gases.

C. Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173, requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261. Throughout this specification, hazardous material includes hazardous chemicals.

1. Hazardous materials include: pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).

D. Indoor Air Quality (IAQ): The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the relative quality of air in a building with respect to contaminants and hazards and is determined by the level of indoor air pollution and other characteristics of the air, including those that impact thermal comfort such as air temperature, relative humidity and air speed.

E. Interior Final Finishes: Materials and products that will be exposed at interior, occupied spaces including but not limited to flooring, wallcovering, finish carpentry, and ceilings.

F. Packaged Dry Products: Materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging including but not limited to carpets, resilient flooring, ceiling tiles, and insulation.

G. Wet Products: Materials and products installed in wet form, including paints, sealants, adhesives, special coatings, and other materials which require curing.

1.4 QUALITY ASSURANCE

A. Inspection and Testing Lab Qualifications: Minimum of 5 years experience in performing the types of testing specified herein.
1.5 PRECONSTRUCTION MEETING

A. After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with University and Architect/Engineer to review and discuss the proposed IAQ Management Plan and develop a mutual understanding of detailed requirements for maintaining indoor air quality and environmental protection.

1.6 SUBMITTALS

A. Indoor Air Quality (IAQ) Management Plan: Not less than 10 business days before the Pre-construction meeting, prepare and submit an IAQ Management Plan including, but not limited to, the following:
   1. Procedures for control of emissions during construction.
      a. Identify schedule for application of interior finishes.
   2. Procedures for moisture control during construction.
      a. Identify porous materials and absorptive materials.
      b. Identify schedule for inspection of stored and installed absorptive materials.
   3. Revise and resubmit Plan as required by University.
      a. Approval of Contractor’s Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations.

B. Product Data:
   1. Submit product data for filtration media used during construction and during operation. Include Minimum Efficiency Reporting Value (MERV).
   2. Submit air pressure difference maps for each mode of operation of HVAC.
   3. Material Safety Data Sheets: Submit MSDSs for inclusion in Operation and Maintenance Manual for the following products. Coordinate with Section 01 78 23 – Operation and Maintenance Data.
      a. Adhesives.
      b. Floor and wall patching/leveling materials.
      c. Caulking and sealants.
      d. Insulating materials.
      e. Fireproofing and firestopping.
      f. Carpet.
      g. Paint.
      h. Clear finish for wood surfaces.
      i. Lubricants.
      j. Cleaning products.

C. Inspection and Test Reports:
   1. Moisture control inspections.
   2. Moisture content testing.
   3. Moisture penetration testing.
   4. Microbial growth testing.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 IAQ MANAGEMENT - EMISSIONS CONTROL

A. Provide point person responsible for the implementation and assurance that the Indoor Air Quality Plan is being implemented.
B. University Indoor Air Quality Plan: Comply with the requirements of the University IAQ Plan, latest version, appended to this Specification Section.

C. Flush-Out: After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total air volume of 14,000 cu.ft. of outdoor air per sq.ft. of floor area while maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60%.

3.2 IAQ MANAGEMENT - MOISTURE CONTROL

A. Housekeeping:
1. Keep materials dry. Protect stored on-site and installed absorptive materials from moisture damage.
2. Verify that installed materials and products are dry prior to sealing and weatherproofing the building envelope.
3. Install interior absorptive materials only after building envelope is sealed and weatherproofed.

B. Inspections: Document and report results of inspections; state whether or not inspections indicate satisfactory conditions.
1. Examine materials for dampness as they arrive. If acceptable to University, dry damp materials completely prior to installation; otherwise, reject materials that arrive damp.
2. Examine materials for mold as they arrive and reject materials that arrive contaminated with mold.
3. Inspect stored and installed absorptive materials regularly for dampness and mold growth. Inspect weekly.
   a. Where stored on-site or installed absorptive materials become wet, notify Architect/Engineer and University. Inspect for damage. If acceptable to University, dry completely prior to closing in assemblies; otherwise, remove and replace with new materials.
4. Basement: Monitor basement and crawlspace humidity, and dehumidify when relative humidity is greater than 85 percent for more than 2 weeks or at the first sign of mold growth.
5. Site drainage: Verify that final grades of site work and landscaping drain surface water and ground water away from the building.
6. Weather-proofing: Inspect moisture control materials as they are being installed. Include the following:
   a. Air and weather-resistive barrier: Verify air and weather-resistive barrier is installed without punctures and/or other damage. Verify air barrier and weather-resistive is sealed completely.
   b. Flashing: Verify correct shingling of the flashing for roof, walls, windows, doors, and other penetrations.
   c. Insulation layer: Verify insulation is installed without voids.
   d. Roofing: In accordance with ASTM D7186 Standard Practice for Quality Assurance Observation of Roof Construction and Repair
7. Plumbing: Verify satisfactory pressure test of pipes and drains is performed before closing in and insulating lines.
8. HVAC: Inspect HVAC system as specified in Section 23 08 00 – Commissioning.
   a. And, inspect HVAC to verify:
      1) Condensate pans are sloped and plumbed correctly.
      2) Access panels are installed to allow for inspection and cleaning of coils and ductwork downstream of coils.
      3) Ductwork and return plenums are air sealed.
      4) Duct insulation is installed and sealed.
      5) Chilled water line and refrigerant line insulation are installed and sealed.

C. Schedule:
1. Schedule work such that absorptive materials, including but not limited to porous insulations, paper-faced gypsum board, ceiling tile, and finish flooring, are not installed until they can be protected from rain and construction-related water.

2. Weather-proof as quickly as possible. Schedule installation of moisture-control materials, including but not limited to air and weather-resistant barriers, flashing, exterior sealants and roofing, at the earliest possible time.

D. Testing for Moisture Content: Test moisture content of porous materials and absorptive materials to ensure that they are dry before sealing them into an assembly. Document and report results of testing. Where tests are not satisfactory, dry materials and retest. If satisfactory results cannot be obtained with retest, remove and replace with new materials.

1. Concrete: Moisture test prior to finish flooring application as specified in Division 09.
2. Wood: Moisture test as per ASTM D4444 - Standard Test Methods for Use and Calibration of Hand-Held Moisture Meters; unless otherwise indicated acceptable upper limits for wood products are < 20% at center of piece; < 15% at surface.
3. Gypsum Board, Gypsum Plaster, Insulation, and other absorptive materials: Moisture test with a Pinless Moisture Meter to assess patterns of moisture, if any.

E. Testing for Moisture Penetration:

1. Windows: Test as per ASTM E1105 Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference at 100 percent static-air-pressure difference specified in applicable Division 08 Sections; unless otherwise indicated acceptable upper limits are no leakage for 15 minutes.
   a. Number of Tests: 1 percent of openings but not less than two.
2. Horizontal Waterproofing (not roofing): Test as per ASTM D5957 Standard Guide for Flood Testing Horizontal Waterproofing Installations; acceptable upper limits are no leakage for 15 minutes.
   a. Test frequency: 100 percent of horizontal waterproofed surfaces.
3. Masonry: Test as per ASTM C1601 Standard Test Method for Field Determination of Water Penetration of Masonry Wall Surfaces; acceptable upper limits are no leakage for 15 minutes.
4. Exterior Walls:
   a. Air tightness of the enclosure test: ASTM E779 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization or ASTM E1827
      1) Air Leakage: The mean value of the air leakage flow rate calculated from measured data at 0.3 in wg (75 Pa) must not exceed 0.25 cu ft/ minute per square foot of envelope area. Measurements must be referenced at standard conditions of 14.696 psi (101.325 KPa) and 68 deg F.

F. Testing for Support of Microbial Growth: Test and report in accordance with ASTM D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers. Indicate susceptibility of product or material to colonization and amplification of microorganisms. Identify microorganisms and conditions of testing.

1. Normal conditions: Perform testing at 35 degrees Centigrade and 50 percent relative humidity.
2. Extreme conditions: Perform worst case scenarios screening tests by providing an atmosphere where environmental conditions may be favorable for microbial growth.
3. Perform testing for the following:
   a. Fireproofing material on appropriate substrate.
   b. Ceiling tile.
   c. Wall covering.
   d. Other appropriate material.
Indoor Air Quality Plan

Project: PN# 18-115993 / CU Denver Building Convert Room 1110 & 1120 to City Center
Completed by: __________________________________________
(Name & Company)
Date: ______________________
________________________________

This plan describes the measures to be taken to provide good indoor air quality (IAQ) during construction and after construction is complete and the occupants have moved into the building. This plan is based on the SMACNA standard “IAQ Guidelines for Occupied Buildings under Construction” and the requirements of the LEED.

It is not the intent of this document to replace or supersede OSHA regulations as to safe construction workplace practices. It remains the responsibility of the Construction Manager and the individual sub-contractors to maintain safe building and site operations. Additional precautions may be necessary when hazardous materials are present.

The plan will address construction IAQ by recommending procedures in five areas of concern, which in turn will allow the building to achieve two LEED program points:

- HVAC system protection
- Containment source control
- Pathway interruption
- Housekeeping
- Scheduling

The following describes the specific measures to be performed in each area of concern:

1. HVAC Protection

   - During construction, provide MERV 13 filters for supply air intake when in use. Provide MERV 8 filters at the return air system openings when in use. Perform frequent maintenance when the HVAC system is being utilized and replace filters as they become loaded, prior to building flushout, and prior to occupancy.
   - When performing construction activities that produce dust, such as drywall sanding, concrete cutting, masonry work, wood sawing or adding insulation, seal off the supply diffusers and return air system openings completely for the duration of the task.
   - Shut down and seal off the supply diffusers and return air ducts during any demolition operations.
   - Whenever the HVAC system is not used during construction, seal off the supply diffusers and return air system openings to prevent the accumulation of dust and debris in the duct system.
   - Do not use the mechanical rooms to store construction or waste materials. Keep rooms clean and neat.
   - Provide periodic duct inspections during construction; if the ducts become contaminated due to inadequate protection, clean the ducts professionally in accordance with NADCA (National Air Duct Cleaning Association) standards.
   - The General Contractor shall take photographs showing measures in place.

2. Source Control

   - Use low VOC products as indicated by the specifications to reduce potential problems.
   - Restrict traffic volume and prohibit idling of motor vehicles where emissions could be drawn into the building.
• Utilize electric or natural gas alternatives for gasoline and diesel equipment where possible and practical. Use low-sulfur diesel in lieu of regular diesel.
• Cycle equipment off when not being used or needed.
• Exhaust pollution sources to the outside with portable fan systems. Prevent exhaust from recirculating back into the building from construction equipment outside the building.
• Keep containers of wet products closed as much as possible. Cover or seal containers of waste materials that can release odor or dust.
• Protect stored on-site or installed absorptive building materials from weather and moisture; wrap with plastic and seal tight to prevent moisture absorption.
• The General Contractor shall take photographs showing measures in place.

3. Pathway Interruption

• Provide dust curtains or temporary enclosures to prevent dust from migrating to other areas when applicable.
• Locate pollutant sources as far away as possible from supply ducts and areas occupied by workers when feasible. Supply and exhaust systems may have to be shut down or isolated during such activity.
• During construction, isolate areas of work to prevent contamination of clean or occupied areas. Pressure differentials may be utilized to prevent contaminated air from entering clean areas.
• Depending on weather, ventilation using 100% outside air will be used to exhaust contaminated air directly to the outside during installation of VOC emitting materials.

4. Housekeeping

• Provide regular cleaning concentrating on HVAC equipment and building spaces to remove contaminants from the building prior to occupancy.
• All coils, air filters, fans and ductwork shall remain clean during installation and, if required, will be cleaned prior to performing the testing, adjusting and balancing of the systems.
• Suppress and minimize dust with wetting agents or sweeping compounds. Utilize efficient and effective dust collecting methods such as a damp cloth, wet mop, or vacuum with particulate filters, or wet scrubber.
• Remove accumulations of water inside the building. Protect porous materials such as insulation and ceiling tile from exposure to moisture.
• Thoroughly clean all interior surfaces prior to replacing filters and running HVAC system for system balancing, commissioning and building flushout.
• Provide photographs of the above activities during construction to document compliance.

5. Scheduling and Construction Activity Sequence

• Schedule high pollution activities that utilize high VOC level products (including paints, sealers, insulation, adhesives, caulking and cleaners) to take place prior to installing highly absorbent materials (such as ceiling tiles, gypsum wall board, fabric furnishings, carpet and insulation, for example). These materials will act as ‘sinks’ for VOCs, odors and other contaminants, and release them later after occupancy.

PLANNING AND INSPECTION CHECKLISTS

The planning and inspection checklists included in this document are useful to ensure construction IAQ management is planned and implemented correctly. The planning checklist should be completed by the contractor prior to construction. The inspection checklists should be completed monthly to confirm the IAQ management plan is being followed. At the time of inspection, photographs should be taken to support the checklist and to provide audit documentation for the USGBC.
CU Denver Building Convert Room 1110 & 1120 to City Center  
University of Colorado Denver  

**University of Colorado Denver IAQ**  

**Planning Checklist**  
(Must be completed weekly)  

<table>
<thead>
<tr>
<th>Project</th>
<th>PN# 18-115993 / CU Denver Building Convert Room 1110 &amp; 1120 to City Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed by:</td>
<td>________________________________________________________________ (Name &amp; Company)</td>
</tr>
<tr>
<td>Date:</td>
<td>____________________________________________</td>
</tr>
</tbody>
</table>

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1. **HVAC Protection**  
   - MERV 13 filters at supply air intake  
   - MERV 8 filters at return air openings  
   - Seal supply diffusers and return air during demolition  
   - Seal supply diffusers and return air openings during construction  
   - Mechanical rooms clean and neat  
   - Periodic duct inspections during construction  
   - General Contractor to document with photographs  

2. **Source Control**  
   - Low/no VOC products as indicated by specifications  
   - Restrict vehicle traffic volume and prohibit idling  
   - Utilize electric or natural gas alternatives for gasoline and diesel  
   - Cycle equipment off when not being used or needed  
   - Exhaust pollution sources to the outside  
   - Keep containers of wet products closed  
   - Cover or seal containers of waste materials  
   - Protect absorptive building materials from weather and moisture  
   - Prevent fume migration from construction vehicles and equipment into adjacent buildings  
   - General Contractor to document with photographs  

3. **Pathway Interruption**  
   - Provide dust curtains or temporary enclosures  
   - Locate pollutant sources as far away as possible from supply dusts and areas occupied by workers  
   - General Contractor to document with photographs  
   - Isolate areas of work to prevent contamination of clean or occupied areas  
   - When using VOC emitting materials ventilate using 100% outside air  
   - General Contractor to document with photographs  

4. **Housekeeping**
   - [ ] Provide regular cleaning, including HVAC equipment
   - [ ] If necessary clean HVAC equipment prior to testing, adjusting and balancing the systems
   - [ ] Suppress and minimize dust with wetting agents or sweeping compounds
   - [ ] Remove accumulations of water inside the building
   - [ ] Protect porous materials
   - [ ] General Contractor to document with photographs

5. **Scheduling and Construction Activity Sequence**
   - [ ] Schedule high pollution activities prior to installing absorbent materials
   - [ ] General Contractor to document with photographs

I confirm the checked activities to be proceeding according to the Construction Indoor Air Quality Plan. Items that are not checked will be addressed, initialed and dated once corrective actions have been taken. Items that are not applicable are labeled as such.

Signed: ____________________________________________ Date: ________________

(Contractor)
University of Colorado Denver IAQ

Inspection Checklist
(Must be completed weekly)

Project
PN# 18-115993 / CU Denver Building Convert Room 1110 & 1120 to City Center

Completed by: ________________________________  (Name & Company)

Date: ______________________________________

1. HVAC Protection
   □ MERV 13 filters at supply air intake
   □ MERV 8 filters at return air openings
   □ Seal supply diffusers and return air during demolition
   □ Seal supply diffusers and return air openings during construction
   □ Mechanical rooms clean and neat
   □ Periodic duct inspections during construction
   □ General Contractor to document with photographs

2. Source Control
   □ Low/no VOC products as indicated by specifications
   □ Restrict vehicle traffic volume and prohibit idling
   □ Utilize electric or natural gas alternatives for gasoline and diesel
   □ Cycle equipment off when not being used or needed
   □ Exhaust pollution sources to the outside
   □ Keep containers of wet products closed
   □ Cover or seal containers of waste materials
   □ Protect absorptive building materials from weather and moisture
   □ General Contractor to document with photographs

3. Pathway Interruption
   □ Provide dust curtains or temporary enclosures
   □ Locate pollutant sources as far away as possible from supply dusts and areas occupied by workers
   □ General Contractor to document with photographs
   □ Isolate areas of work to prevent contamination of clean or occupied areas
   □ When using VOC emitting materials ventilate using 100% outside air
   □ General Contractor to document with photographs

4. Housekeeping

IAQ Inspection Checklist
REV: 02/14/09
Provide regular cleaning, including HVAC equipment
If necessary clean HVAC equipment prior to testing, adjusting and balancing the systems
Suppress and minimize dust with wetting agents or sweeping compounds
Remove accumulations of water inside the building
Protect porous materials
General Contractor to document with photographs

5. Scheduling and Construction Activity Sequence

Schedule high pollution activities prior to installing absorbent materials
General Contractor to document with photographs

I confirm the checked activities to be proceeding according to the Construction Indoor Air Quality Plan. Items that are not checked will be addressed, initialed and dated once corrective actions have been taken. Items that are not applicable are labeled as such.

Signed: ________________________________ Date: ________________

(Contractor)
SECTION 01 40 00 - QUALITY REQUIREMENTS

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 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/Engineer, University, or authorities having jurisdiction are not limited by provisions of this Section.

4. Specific test and inspection requirements are not specified in this Section.

C. Related Requirements:

1. Section 01 42 00 "Reference" for list of references, standards and definitions.

2. Section 01 91 13 “General Commissioning” for coordination of testing with commissioning activities.

3. Division 23 for testing, adjusting and balancing of mechanical systems.

4. Division 26 for testing of electrical systems.

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/Engineer.

C. 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.
D. 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.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. 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).

I. 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.

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/Engineer 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/Engineer for a decision before proceeding.

1.5 ACTION SUBMITTALS N/A

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/Engineer.
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.
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 University'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.

1. Monitor quality control over products, services, site conditions, and workmanship to produce work of specified quality.
2. Comply fully with manufacturers' instructions, including each step in sequence.
3. If manufacturers' instructions conflict with Contract Document requirements, request clarification from Architect/Engineer before proceeding.
4. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
5. Perform work by persons qualified to produce workmanship of specified quality.

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. Subcontractor and 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. In addition comply with the following:

1. For all trades: Proof of applicable licensing.
2. Electrical contractors:
3. Plumbing Contractors:
   c. Gas piping installations: State of Colorado master plumber with minimum 5 years institutional or heavy commercial gas piping experience. Provide an on-site supervisor with a minimum of 3 years of supervisory experience.
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 or ASTM D 3740 as appropriate; 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.
4. Authorized to operate in the State of Colorado.
5. Calibrate testing equipment at reasonable intervals with devices of accuracy traceable to National Bureau of Standards or of accepted values of natural physical constants.

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. When required, build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
   e. When required, 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, mockups, and laboratory mockups, as applicable; 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/Engineer, 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.
1.9 QUALITY CONTROL

A. University Responsibilities: Where quality-control services are indicated as University's responsibility, University will engage a qualified testing agency to perform these services.

1. University 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. Payment for these services will be made by the University.
3. 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.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to University 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 University, unless agreed to in writing by University.
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 01 33 00 "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.


1. Notify Architect/Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

6. 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 including, but not limited to, safe storage and proper curing of concrete test cylinders at Project site for first 24 hours after casting as required by ASTM C 31.
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. Manufactured Items and Equipment: Where manufactured products or equipment are required to have representative samples tested, do not use such materials or equipment until tests have been made and the materials or equipment found to be acceptable. Do not incorporate in the work any product which becomes unfit for use after acceptance.

J. 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 University, Architect/Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: University will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of University, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect/Engineer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect/Engineer with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. 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 including instructions received from University. 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/Engineer.
4. Identification of testing agency or special inspector conducting test or inspection.
5. Disposition: Pass, fail, nature of defects, if any.
6. Date and descriptions of remedial or correction action taken.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect/Engineer's reference during normal working hours.

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 01 73 00 "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.

3.3 SCHEDULE OF INSPECTIONS AND TESTS BY UNIVERSITY

A. University will engage testing agency and pay for testing and inspection associated with the following materials and systems, where included in the Project:

1. Compaction density of fill and backfill.
2. Drilled pier end bearing conditions and depths.
4. Precast concrete.
5. Post-tensioned concrete tendons.
7. Structural steel field welds and bolted connections.
8. Spray-applied fireproofing.
10. Asphallic concrete paving.
11. Foundation drainage systems.
12. Drainage structures and piping.
15. Fluid applied membranes.
16. Thermal imaging.
17. Curtain wall, window, and door field testing.
18. Ceiling hanger wire pull-out.
20. Field sound testing of operable partitions.
22. Fan vibration.

END OF SECTION 01 40 00
SECTION 01 41 00 - REGULATORY REQUIREMENTS

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:
   1. Building Department Authority.
   2. MS 4 Storm Water and Water Quality Permits
   3. Applicable Codes and Standards.

1.3 BUILDING DEPARTMENT AUTHORITY

A. The University of Colorado Denver is charged with the responsibility of ensuring that provision of applicable codes, standards and guidelines are met on its campuses.

B. The University Denver campus has an established Building Authority responsible to review and examine buildings and plan documents, to permit and inspect construction and/or demolition to ensure conformance to codes adopted by the University and issue certificates of temporary occupancy and occupancy if satisfactory conformance is demonstrated.

C. The authority is executed by the Campus Building Official (CBO) who has the responsibility to perform all the duties set forth in the Current Approved State Buildings Codes and other applicable codes and standards indicated in the “Applicable Codes and Standards” Article of this Section.

D. Permits: Obtain a separate permit for each Project from the Office of the CBO prior to erecting, constructing, enlarging, repairing, moving, removing, converting or demolishing any building or portion thereof. Coordinate and obtain all permits through the University Project Manager. The Contractor is not responsible for costs associated with construction permits.
   1. Exempt work: A building permit is not required for the following:
      a. Fences less than or equal to 6 feet tall.
      b. Movable casework, counters and partitions not over 5 feet 9 inches tall with no electrical or plumbing.
      c. Platforms, walks, and driveways not more than 30 inches above grade and not over any basement or story below.
      d. Painting, papering and similar finish work.
      e. Other work of limited scope at the discretion of the CBO.

E. Permit Issuance: The CBO, or at the discretion of the CBO a third party code consultant, will review application, Drawings, Specifications, computations and other data filed for permit. Complete the permit application with the University Project Manager. Permits require submittal of two (2) stamped, signed sets of Construction Documents, including Drawings, Specifications and all Addenda, and one (1) set of each engineering discipline’s calculations, where such calculations are required. If CBO determines that submittal conforms to the requirements of the Building Code and other applicable codes, standards, laws, regulations and ordinances, an inspection record card will be issued with the building permit. Keep one
stamped set of documents on site. The University will keep one stamped set in the Campus Support plan room.

F. Suspension or Revocation of Permit: CBO may, in writing, suspend or revoke a permit issued in error or on the basis of submitted information that is incorrect or that is in violation of the Building Code and other applicable codes and standards.

G. Posting of Permit: Post the Permit in a visible and protected location near the access to the project.

H. Inspection Record Card: Post the Inspection Record Card next to the permit in a visible and protected location near the access to the project. CBO will make required entries based on inspection of the work.

I. Inspection Requests:
1. Notify CBO that work is ready for inspection two business days before such inspection is desired by telephoning the number posted on the permit. The CBO retains the right to require requests in writing.
2. A re-inspection fee may be charged for prior rejected items.

J. Construction Inspections:
1. Contractor is not responsible for costs associated with construction inspections, except re-inspections. The CBO or his/her designee will perform all general building, electrical and plumbing inspections. All construction or work for which a permit is required must remain accessible and exposed for inspection purposes. Provide access to and means for inspection of work.
2. Site Utilities: Contact and comply with all requirements of City and County of Denver for site utility inspections.
3. Plumbing and Electrical Inspections: For new buildings and major additions, contact and comply with all requirements of State of Colorado Plumbing and Electrical Boards.
4. Provisions for structural and other special inspections required by Contract Documents, current approved State Building Codes and University Codes will be provided by the University.

K. Certification of Occupancy:
1. When CBO inspects the project and finds no violations of any provision of the Building Code, other applicable codes, standards, laws, regulations and ordinances, CBO will issue a Certification of Occupancy (CO) which will contain the following:
   a. Building permit number.
   b. Address of building.
   c. Name and address of Owner.
   d. Description of building or portion thereof for which certification is issued.
   e. Statement that described building or portion thereof has been inspected for compliance with the requirements of the Building Code, other applicable codes, standards, laws, regulations and ordinances, as relates to type of occupancy and use for which the building is intended.
2. Temporary Certificate of Occupancy (TCO): If CBO finds no substantial hazard will result from occupancy of any building or portion thereof before the same is completed, CBO may issue a TCO for the use of a portion or portions of a building or structure prior to the completion of the entire building or structure.
3. Posting of CO: Provide a copy to the University Project Manager and post in a conspicuous location on premises. CO may not be removed except by CBO upon initial occupancy.
4. Revocation of CO:

1.4 MS4 STORM WATER AND WATER QUALITY PERMITS
A. Obtain necessary State of Colorado and City and County of Denver Permits to the extent that Project impacts site.

1.5 APPLICABLE CODES AND STANDARDS

A. The following approved building codes and standards have been adopted by State Buildings Programs (SBP) as the minimum requirements to be applied to all state-owned buildings and physical facilities including capital construction and controlled maintenance construction projects. Current applicable codes can be obtained from The Office of the State Architect’s website.

B. University of Colorado Denver Codes and Standards: The following codes and standards supplement those indicated on the Office of the State Architect website.

   a. [http://ucdenver.edu/about/departments/FacilitiesManagement/FacilitiesProjects/Pages/GuidelinesStandards.aspx](http://ucdenver.edu/about/departments/FacilitiesManagement/FacilitiesProjects/Pages/GuidelinesStandards.aspx)


   a. Use the most restrictive interpretation where NFPA 101 conflicts with the IBC requirements.


21. CDC-NIH Bio-safety in Microbiological and Biomedical Laboratories (BMBL); latest edition.


CU Denver Building Convert Room 1110 & 1120 to City Center
University of Colorado Denver


C. Other Standards: As indicated in individual Specification Sections.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 41 00
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:

1. Definitions.
2. Industry Standards.
3. Abbreviations and Acronyms.

B. Related Requirements:

1. Section 01 10 00 “Summary” for an explanation of specification and drawing conventions.
2. Section 01 41 00 “Regulatory Requirements” for a list of applicable codes.

1.3 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

1. Definitions in this Section are not intended to be complete, exhaustive or exclusive. They are general and apply to the Work to the extent that such definitions are not stated more explicitly in other provisions of the Contract Documents.

B. "Approved": When used to convey Architect/Engineer's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect/Engineer's duties and responsibilities as stated in the Conditions of the Contract. Except where expressly indicated, such approval does not release the Contractor from responsibility to fulfill requirements of the Contract Documents.

C. “Backup”: N+1 system.

D. "Directed": A command or instruction by Architect/Engineer. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

E. “EHS”: Environmental Health and Safety.

F. “Engineer”: Architect/Engineer. Other terms including “Mechanical Engineer”, “Electrical Engineer”, or “Structural Engineer” have the same meaning as “Engineer.”

G. “General Conditions”: Contract terms contained in Contractor’s Agreement Design/Bid/Build, State Form SC-6.21 and The General Conditions of the Construction Contract Design/Bid/Build, State Form SC-6.23 “General Requirements”: Provisions and requirements of all Division 01 Sections as they apply to all aspects of the Work.
H. “Guarantee”: The narrow definition of the term “warranty” applying to both “warranty” and “guarantee” which terms are used interchangeably.

I. "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."

J. “Redundant”: 2N system. The level of redundancy is determined by design.

K. "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, whether lawfully imposed by authorities having jurisdiction or not.

L. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

M. "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.

N. “Owner”: Principal Representative and/or University.

O. "Provide": Furnish and install, complete and ready for the intended use.

P. “Project Manual”: Bound, printed volume or volumes including Conditions of the Contract and Specifications, which may also include bidding requirements, contract forms, details, schedules, surveys, reports or other relevant items that may or may not be Contract Documents.

Q. "Project Site": Space available for performing construction activities, either exclusively or in conjunction with others performing other work as part of the Project. 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.

R. “Supplementary Conditions”: University Special Supplementary General Conditions. Other terms including “Supplementary General Conditions” shall have the same meaning.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

1. Referenced standards take precedence over standards that are not referenced but generally recognized in the construction industry as applicable.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents.

1. Updated Codes and Standards: Where an applicable code or standard has been revised and reissued after the date of the Contract Documents and before performance of Work affected, submit Contractor-Initiated Change Order Bulletin and Change Order Proposal in accordance with Section 01 26 00 “Contract Modification Procedures” for consideration to modify contract requirements to comply with revised code or standard.
C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
2. Where required by individual Specification Sections provide and maintain copies of referenced codes and standards at Project Site.
3. Although copies of standards needed for enforcement of requirements may be part of required submittals, the Architect/Engineer reserves the right to require the Contractor to submit additional copies as necessary for enforcement of requirements.

D. Unreferenced Standards: Unreferenced standards are not directly applicable to the Work, except as a general requirement of whether the Work complies with recognized construction industry standards.

E. Conflicting Requirements: Where compliance with two or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the Contract Documents indicate otherwise. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Architect/Engineer for a decision before proceeding.

1.5 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

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<th>Acronym</th>
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<td>AABC</td>
<td>Associated Air Balance Council</td>
<td>(202) 737-0202</td>
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<td>AAMA</td>
<td>American Architectural Manufacturers Association</td>
<td>(847) 303-5664</td>
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<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials</td>
<td>(202) 624-5800</td>
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<td>AATCC</td>
<td>American Association of Textile Chemists and Colorists</td>
<td>(919) 549-8141</td>
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<td>ABMA</td>
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<td><a href="http://www.americanbearings.org">www.americanbearings.org</a></td>
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<td>ACI</td>
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<td>(248) 848-3700</td>
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<td>ACPA</td>
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<td>AEIC</td>
<td>Association of Edison Illuminating Companies, Inc. (The)</td>
<td>(205) 257-2530</td>
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<tr>
<td>AF&amp;PA</td>
<td>American Forest &amp; Paper Association</td>
<td>(800) 878-8878</td>
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<td><a href="http://www.aga.org">www.aga.org</a> (202) 824-7000</td>
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<td>AHAM</td>
<td><a href="http://www.aham.org">www.aham.org</a> (202) 872-5955</td>
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<td>AHRI</td>
<td><a href="http://www.ahrinet.org">www.ahrinet.org</a> (703) 524-8800</td>
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<td>AI</td>
<td><a href="http://www.asphaltinstitute.org">www.asphaltinstitute.org</a> (859) 288-4960</td>
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<td>AIA</td>
<td><a href="http://www.aia.org">www.aia.org</a> (800) 242-3837 (202) 626-7300</td>
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<td>AISC</td>
<td><a href="http://www.aisc.org">www.aisc.org</a> (800) 644-2400 (312) 670-2400</td>
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<td><a href="http://www.steel.org">www.steel.org</a> (202) 452-7100</td>
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<td>AITC</td>
<td><a href="http://www.aite-glulam.org">www.aite-glulam.org</a> (303) 792-9559</td>
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<td>AMCA</td>
<td><a href="http://www.amca.org">www.amca.org</a> (847) 394-0150</td>
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<td>ANSI</td>
<td><a href="http://www.an">www.an</a> si.org (202) 293-8020</td>
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<td>AOSA</td>
<td><a href="http://www.aosaseed.com">www.aosaseed.com</a> (607) 256-3313</td>
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<td>APA</td>
<td><a href="http://www.apawood.org">www.apawood.org</a> (253) 565-6600</td>
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<td><a href="http://www.archprecast.org">www.archprecast.org</a> (239) 454-6989</td>
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<td>API</td>
<td><a href="http://www.api.org">www.api.org</a> (202) 682-8000</td>
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<td>ARI</td>
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<td>ARI</td>
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<td><a href="http://www.asphaltroofing.org">www.asphaltroofing.org</a> (202) 207-0917</td>
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<td>ASCE</td>
<td><a href="http://www.asce.org">www.asce.org</a> (800) 548-2723 (703) 295-6300</td>
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REFERENCES
### CU Denver Building Convert Room 1110 & 1120 to City Center
University of Colorado Denver

| ASCE/SEI | American Society of Civil Engineers/Structural Engineering Institute (See ASCE) |
| ASHRAE | American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org (800) 527-4723 |
| ASME | ASME International (American Society of Mechanical Engineers) www.asme.org (800) 843-2763 (973) 882-1170 |
| ASSE | American Society of Safety Engineers (The) www.asse.org (847) 699-2929 |
| ASSE | American Society of Sanitary Engineering www.asse-plumbing.org (440) 835-3040 |
| ATIS | Alliance for Telecommunications Industry Solutions www.atis.org (202) 628-6380 |
| AWEA | American Wind Energy Association www.aWEA.org (202) 383-2500 |
| AWI | Architectural Woodwork Institute www.awinett.org (571) 323-3636 |
| AWMAC | Architectural Woodwork Manufacturers Association of Canada www.awmac.com (403) 453-7387 |
| AWPA | American Wood Protection Association (Formerly: American Wood-Preservers' Association) www.awpa.com (205) 733-4077 |
| AWS | American Welding Society www.aws.org (800) 443-9353 (305) 443-9353 |
| AWWA | American Water Works Association www.awwa.org (800) 926-7337 (303) 794-7711 |
| BHMA | Builders Hardware Manufacturers Association www.buildershardware.com (212) 297-2122 |
| BIA | Brick Industry Association (The) www.gobrick.com (703) 620-0010 |
| BICSI | BICSI, Inc. www.bicsi.org (800) 242-7405 (813) 979-1991 |
| BIFMA | BIFMA International (Business and Institutional Furniture Manufacturer's Association) www.bifma.com (616) 285-3963 |

REFERENCES
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<td>BISSC</td>
<td>Baking Industry Sanitation Standards Committee</td>
<td><a href="http://www.bissc.org">www.bissc.org</a></td>
<td>(866) 342-4772</td>
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<td>CDA</td>
<td>Copper Development Association</td>
<td><a href="http://www.copper.org">www.copper.org</a></td>
<td>(800) 232-3282 (212) 251-7200</td>
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<td>CEA</td>
<td>Canadian Electricity Association</td>
<td><a href="http://www.electricity.ca">www.electricity.ca</a></td>
<td>(613) 230-9263</td>
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<td>CEA</td>
<td>Consumer Electronics Association</td>
<td><a href="http://www.ce.org">www.ce.org</a></td>
<td>(866) 858-1555 (703) 907-7600</td>
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<td>CFFA</td>
<td>Chemical Fabrics &amp; Film Association, Inc.</td>
<td><a href="http://www.chemicalfabricsandfilm.com">www.chemicalfabricsandfilm.com</a></td>
<td>(216) 241-7333</td>
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<td>CFSEI</td>
<td>Cold-Formed Steel Engineers Institute</td>
<td><a href="http://www.cfsei.org">www.cfsei.org</a></td>
<td>(866) 465-4732 (202) 263-4488</td>
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<td>CGA</td>
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<td><a href="http://www.cganet.com">www.cganet.com</a></td>
<td>(703) 788-2700</td>
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<td>CIMA</td>
<td>Cellulose Insulation Manufacturers Association</td>
<td><a href="http://www.cellulose.org">www.cellulose.org</a></td>
<td>(888) 881-2462 (937) 222-2462</td>
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<td>CISCA</td>
<td>Ceilings &amp; Interior Systems Construction Association</td>
<td><a href="http://www.cisca.org">www.cisca.org</a></td>
<td>(630) 584-1919</td>
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<td>CISPI</td>
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<td><a href="http://www.cispi.org">www.cispi.org</a></td>
<td>(404) 622-0073</td>
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<td>CLFMI</td>
<td>Chain Link Fence Manufacturers Institute</td>
<td><a href="http://www.chainlinkinfo.org">www.chainlinkinfo.org</a></td>
<td>(301) 596-2583</td>
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<td>CPA</td>
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<td><a href="http://www.pbmfd.com">www.pbmfd.com</a></td>
<td>(703) 724-1128</td>
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<td>CRI</td>
<td>Carpet and Rug Institute (The)</td>
<td><a href="http://www.carpet-rug.org">www.carpet-rug.org</a></td>
<td>(706) 278-3176</td>
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<td>CRRRC</td>
<td>Cool Roof Rating Council</td>
<td><a href="http://www.coolroofs.org">www.coolroofs.org</a></td>
<td>(866) 465-2523 (510) 485-7175</td>
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<td>CRSI</td>
<td>Concrete Reinforcing Steel Institute</td>
<td><a href="http://www.crsi.org">www.crsi.org</a></td>
<td>(800) 328-6306 (847) 517-1200</td>
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<td>CSA</td>
<td>Canadian Standards Association</td>
<td><a href="http://www.csa.ca">www.csa.ca</a></td>
<td>(800) 463-6727 (416) 747-4000</td>
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<td>(866) 797-4272</td>
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<td>CSI</td>
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<td>(800) 689-2900</td>
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<td>CSSB</td>
<td>Cedar Shake &amp; Shingle Bureau</td>
<td>(604) 820-7700</td>
<td><a href="http://www.cedarbureau.org">www.cedarbureau.org</a></td>
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<td>CTI</td>
<td>Cooling Technology Institute (Formerly: Cooling Tower Institute)</td>
<td>(281) 583-4087</td>
<td><a href="http://www.cti.org">www.cti.org</a></td>
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<td>CWC</td>
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<td>DASMA</td>
<td>Door and Access Systems Manufacturers Association</td>
<td>(216) 241-7333</td>
<td><a href="http://www.dasma.com">www.dasma.com</a></td>
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<td>DHI</td>
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<td>(703) 222-2010</td>
<td><a href="http://www.dhi.org">www.dhi.org</a></td>
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<td>ECA</td>
<td>Electronic Components Association</td>
<td>(703) 907-8024</td>
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<td>EIMA</td>
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<td>(800) 294-3462</td>
<td><a href="http://www.eima.com">www.eima.com</a></td>
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<td>EJMA</td>
<td>Expansion Joint Manufacturers Association, Inc.</td>
<td>(914) 332-0040</td>
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<td>ESD</td>
<td>ESD Association (Electrostatic Discharge Association)</td>
<td>(315) 339-6937</td>
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<td>EVO</td>
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<td>(415) 367-3643</td>
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<td>FM Approvals</td>
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<td>(781) 762-4300</td>
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<td>FM Global</td>
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<td>FRSA</td>
<td>Florida Roofing, Sheet Metal &amp; Air Conditioning Contractors Association, Inc.</td>
<td>(407) 671-3772</td>
<td><a href="http://www.floridaroof.com">www.floridaroof.com</a></td>
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<td>FSC</td>
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<td>(612) 353-4511</td>
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<td>GA</td>
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<td>(301) 277-8686</td>
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<td>GANA</td>
<td>Glass Association of North America</td>
<td>(785) 271-0208</td>
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<td>GS</td>
<td>Green Seal</td>
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<td>HI</td>
<td>Hydraulic Institute</td>
<td>(973) 267-9700</td>
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<td>HPVA</td>
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<td>(703) 435-2900</td>
<td><a href="http://www.hpva.org">www.hpva.org</a></td>
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<td>HPW</td>
<td>H. P. White Laboratory, Inc.</td>
<td>(410) 838-6550</td>
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<td>IAPSC</td>
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<td>(415) 536-0288</td>
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<td>ICBO</td>
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<td>ICC</td>
<td>International Code Council</td>
<td>(888) 422-7233</td>
<td><a href="http://www.iccsafe.org">www.iccsafe.org</a></td>
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<td>ICEA</td>
<td>Insulated Cable Engineers Association, Inc.</td>
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<td>ICRI</td>
<td>International Concrete Repair Institute, Inc.</td>
<td><a href="http://www.icri.org">www.icri.org</a></td>
<td>(847) 827-0830</td>
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<td>IEC</td>
<td>International Electrotechnical Commission</td>
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<td>41 22 919 02 11</td>
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<td>Institute of Electrical and Electronics Engineers, Inc. (The)</td>
<td><a href="http://www.ieee.org">www.ieee.org</a></td>
<td>(212) 419-7900</td>
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<td>IES</td>
<td>Illuminating Engineering Society</td>
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<td><a href="http://www.ies.org">www.ies.org</a></td>
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<td>IEST</td>
<td>Institute of Environmental Sciences and Technology</td>
<td><a href="http://www.iest.org">www.iest.org</a></td>
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<td>IGMA</td>
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<td><a href="http://www.igmaonline.org">www.igmaonline.org</a></td>
<td>(613) 233-1510</td>
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<td>IGSHPA</td>
<td>International Ground Source Heat Pump Association</td>
<td><a href="http://www.igshpa.okstate.edu">www.igshpa.okstate.edu</a></td>
<td>(405) 744-5175</td>
<td></td>
</tr>
<tr>
<td>ILI</td>
<td>Indiana Limestone Institute of America, Inc.</td>
<td><a href="http://www.iliai.com">www.iliai.com</a></td>
<td>(812) 275-4426</td>
<td></td>
</tr>
<tr>
<td>Intertek</td>
<td>Intertek Group</td>
<td>(Formerly: ETL SEMCO; Intertek Testing Service NA)</td>
<td><a href="http://www.intertek.com">www.intertek.com</a></td>
<td>(800) 967-5352</td>
</tr>
<tr>
<td>ISA</td>
<td>International Society of Automation (The)</td>
<td>(Formerly: Instrumentation, Systems, and Automation Society)</td>
<td><a href="http://www.isa.org">www.isa.org</a></td>
<td>(919) 549-8411</td>
</tr>
<tr>
<td>ISAS</td>
<td>Instrumentation, Systems, and Automation Society (The)</td>
<td>(See ISA)</td>
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<tr>
<td>ISFA</td>
<td>International Surface Fabricators Association</td>
<td>(Formerly: International Solid Surface Fabricators Association)</td>
<td><a href="http://www.isfanow.org">www.isfanow.org</a></td>
<td>(877) 464-7732</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
<td><a href="http://www.iso.org">www.iso.org</a></td>
<td>41 22 749 01 11</td>
<td></td>
</tr>
<tr>
<td>ISSFA</td>
<td>International Solid Surface Fabricators Association</td>
<td>(See ISFA)</td>
<td></td>
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<tr>
<td>ITU</td>
<td>International Telecommunication Union</td>
<td><a href="http://www.itu.int/home">www.itu.int/home</a></td>
<td>41 22 730 51 11</td>
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</table>

REFERENCES
CU Denver Building Convert Room 1110 & 1120 to City Center
University of Colorado Denver

KCMA  Kitchen Cabinet Manufacturers Association
www.kcma.org  (703) 264-1690

LMA  Laminating Materials Association
(See CPA)

LPI  Lightning Protection Institute
www.lightning.org  (800) 488-6864

MBMA  Metal Building Manufacturers Association
www.mbma.com  (216) 241-7333

MCA  Metal Construction Association
www.metalconstruction.org  (847) 375-4718

MFMA  Maple Flooring Manufacturers Association, Inc.
www.maplefloor.org  (888) 480-9138

MFMA  Metal Framing Manufacturers Association, Inc.
www.metalframingmfg.org  (312) 644-6610

MHIA  Material Handling Industry of America
www.mhia.org  (800) 345-1815
(704) 676-1190

MIA  Marble Institute of America
www.marble-institute.com  (440) 250-9222

MMPA  Moulding & Millwork Producers Association
(Formerly: Wood Moulding & Millwork Producers Association)
www.wmmpa.com  (800) 550-7889
(530) 661-9591

MPI  Master Painters Institute
www.paintinfo.com  (888) 674-8937
(604) 298-7578

MSS  Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
www.mss-hq.org  (703) 281-6613

NAAMM  National Association of Architectural Metal Manufacturers
www.naamm.org  (630) 942-6591

NACE  NACE International
(Formerly: National Association of Corrosion Engineers International)
www.nace.org  (800) 797-6223
(281) 228-6200

NADCA  National Air Duct Cleaners Association
www.nadca.com  (202) 737-2926

NAIMA  North American Insulation Manufacturers Association
www.naima.org  (703) 684-0084

NBGQA  National Building Granite Quarries Association, Inc.
www.nbgsa.com  (800) 557-2848

NCAA  National Collegiate Athletic Association (The)
www.ncaa.org  (317) 917-6222

REFERENCES
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<tr>
<th>Acronym</th>
<th>Full Name</th>
<th>Address</th>
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<tr>
<td>NCMA</td>
<td>National Concrete Masonry Association</td>
<td><a href="http://www.ncma.org">www.ncma.org</a></td>
<td>(703) 713-1900</td>
</tr>
<tr>
<td>NEBB</td>
<td>National Environmental Balancing Bureau</td>
<td><a href="http://www.nebb.org">www.nebb.org</a></td>
<td>(301) 977-3698</td>
</tr>
<tr>
<td>NECA</td>
<td>National Electrical Contractors Association</td>
<td><a href="http://www.necanet.org">www.necanet.org</a></td>
<td>(301) 657-3110</td>
</tr>
<tr>
<td>NeLMA</td>
<td>Northeastern Lumber Manufacturers Association</td>
<td><a href="http://www.nelma.org">www.nelma.org</a></td>
<td>(207) 829-6901</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Electrical Manufacturers Association</td>
<td><a href="http://www.nema.org">www.nema.org</a></td>
<td>(703) 841-3200</td>
</tr>
<tr>
<td>NETA</td>
<td>InterNational Electrical Testing Association</td>
<td><a href="http://www.netaworld.org">www.netaworld.org</a></td>
<td>(888) 300-6382 (269) 488-6382</td>
</tr>
<tr>
<td>NFHS</td>
<td>National Federation of State High School Associations</td>
<td><a href="http://www.nfhs.org">www.nfhs.org</a></td>
<td>(317) 972-6900</td>
</tr>
<tr>
<td>NFPA</td>
<td>NFPA (National Fire Protection Association)</td>
<td><a href="http://www.nfpa.org">www.nfpa.org</a></td>
<td>(800) 344-3555 (617) 770-3000</td>
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<tr>
<td>NFPA</td>
<td>NFPA International (See NFPA)</td>
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<td>NFRC</td>
<td>National Fenestration Rating Council</td>
<td><a href="http://www.nfrc.org">www.nfrc.org</a></td>
<td>(301) 589-1776</td>
</tr>
<tr>
<td>NHLA</td>
<td>National Hardwood Lumber Association</td>
<td><a href="http://www.nhla.com">www.nhla.com</a></td>
<td>(800) 933-0318 (901) 377-1818</td>
</tr>
<tr>
<td>NLGA</td>
<td>National Lumber Grades Authority</td>
<td><a href="http://www.nlga.org">www.nlga.org</a></td>
<td>(604) 524-2393</td>
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<tr>
<td>NOFMA</td>
<td>National Oak Flooring Manufacturers Association</td>
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<tr>
<td>NOMMA</td>
<td>National Ornamental &amp; Miscellaneous Metals Association</td>
<td><a href="http://www.nomma.org">www.nomma.org</a></td>
<td>(888) 516-8585</td>
</tr>
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<td>NRCA</td>
<td>National Roofing Contractors Association</td>
<td><a href="http://www.nrca.net">www.nrca.net</a></td>
<td>(800) 323-9545 (847) 299-9070</td>
</tr>
<tr>
<td>NRMCA</td>
<td>National Ready Mixed Concrete Association</td>
<td><a href="http://www.nrmca.org">www.nrmca.org</a></td>
<td>(888) 846-7622 (301) 587-1400</td>
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<td>NSF</td>
<td>NSF International (National Sanitation Foundation Interna</td>
<td><a href="http://www.nsf.org">www.nsf.org</a></td>
<td>(800) 673-6275 (734) 769-8010</td>
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<tr>
<td>NSPE</td>
<td>National Society of Professional Engineers</td>
<td><a href="http://www.nspe.org">www.nspe.org</a></td>
<td>(703) 684-2800</td>
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</table>
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NSSGA  National Stone, Sand & Gravel Association  (800) 342-1415  www.nssga.org  (703) 525-8788

NTMA  National Terrazzo & Mosaic Association, Inc. (The)  (800) 323-9736  www.ntma.com

NWFA  National Wood Flooring Association  (800) 422-4556  www.nwfa.org  (636) 519-9663

PCI  Precast/Prestressed Concrete Institute  (312) 786-0300  www pci.org

PDI  Plumbing & Drainage Institute  (800) 589-8956  www pdionline.org  (978) 557-0720

PLASA  PLASA  (Formerly: ESTA - Entertainment Services and Technology Association)  (212) 244-1505  www.plasa.org

RCSC  Research Council on Structural Connections  www boltcouncil.org

RFCI  Resilient Floor Covering Institute  (706) 882-3833  www.rfci.com

RIS  Redwood Inspection Service  (925) 935-1499  www.redwoodinspection.com

SAE  SAE International  (877) 606-7323  www.sae.org  (724) 776-4841

SBCCI  Southern Building Code Congress International, Inc.  (See ICC)

SCTE  Society of Cable Telecommunications Engineers  (800) 542-5040  www.scte.org  (610) 363-6888

SDI  Steel Deck Institute  (847) 458-4647  www.sdi.org

SDI  Steel Door Institute  www.steeldoor.org  (440) 899-0010

SEFA  Scientific Equipment and Furniture Association  (877) 294-5424  www.sefalabs.com  (516) 294-5424

SEI/ASCE  Structural Engineering Institute/American Society of Civil Engineers  (See ASCE)

SIA  Security Industry Association  (866) 817-8888  www.siaonline.org  (703) 683-2075

REFERENCES
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<th>Reference</th>
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<th>Website</th>
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<td>SJI</td>
<td>Steel Joist Institute</td>
<td>(843) 293-1995</td>
<td><a href="http://www.steeljoist.org">www.steeljoist.org</a></td>
</tr>
<tr>
<td>SMA</td>
<td>Screen Manufacturers Association</td>
<td>(773) 636-0672</td>
<td><a href="http://www.smainfo.org">www.smainfo.org</a></td>
</tr>
<tr>
<td>SMACNA</td>
<td>Sheet Metal and Air Conditioning Contractors' National Association</td>
<td>(703) 803-2980</td>
<td><a href="http://www.smacna.org">www.smacna.org</a></td>
</tr>
<tr>
<td>SMPTE</td>
<td>Society of Motion Picture and Television Engineers</td>
<td>(914) 761-1100</td>
<td><a href="http://www.smpte.org">www.smpte.org</a></td>
</tr>
<tr>
<td>SPFA</td>
<td>Spray Polyurethane Foam Alliance</td>
<td>(800) 523-6154</td>
<td><a href="http://www.sprayfoam.org">www.sprayfoam.org</a></td>
</tr>
<tr>
<td>SPIB</td>
<td>Southern Pine Inspection Bureau</td>
<td>(850) 434-2611</td>
<td><a href="http://www.spib.org">www.spib.org</a></td>
</tr>
<tr>
<td>SPRI</td>
<td>Single Ply Roofing Industry</td>
<td>(781) 647-7026</td>
<td><a href="http://www.spri.org">www.spri.org</a></td>
</tr>
<tr>
<td>SSINA</td>
<td>Specialty Steel Industry of North America</td>
<td>(800) 982-0355</td>
<td><a href="http://www.ssina.com">www.ssina.com</a></td>
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<td>SSPC</td>
<td>SSPC: The Society for Protective Coatings</td>
<td>(877) 281-7772</td>
<td><a href="http://www.sspc.org">www.sspc.org</a></td>
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<tr>
<td>STI</td>
<td>Steel Tank Institute</td>
<td>(847) 438-8265</td>
<td><a href="http://www.steeltank.com">www.steeltank.com</a></td>
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<td>SWI</td>
<td>Steel Window Institute</td>
<td>(216) 241-7333</td>
<td><a href="http://www.steelwindows.com">www.steelwindows.com</a></td>
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<td>SWPA</td>
<td>Submersible Wastewater Pump Association</td>
<td>(847) 681-1868</td>
<td><a href="http://www.swpa.org">www.swpa.org</a></td>
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<tr>
<td>TCA</td>
<td>Tilt-Up Concrete Association</td>
<td>(319) 895-6911</td>
<td><a href="http://www.tilt-up.org">www.tilt-up.org</a></td>
</tr>
<tr>
<td>TCNA</td>
<td>Tile Council of North America, Inc.</td>
<td>(864) 646-8453</td>
<td><a href="http://www.tileusa.com">www.tileusa.com</a></td>
</tr>
<tr>
<td>TEMA</td>
<td>Tubular Exchanger Manufacturers Association, Inc.</td>
<td>(914) 332-0040</td>
<td><a href="http://www.tema.org">www.tema.org</a></td>
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<tr>
<td>TIA</td>
<td>Telecommunications Industry Association</td>
<td>(703) 907-7700</td>
<td><a href="http://www.tiaonline.org">www.tiaonline.org</a></td>
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<tr>
<td>TIA/EIA</td>
<td>Telecommunications Industry Association/Electronic Industries Alliance</td>
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(See TIA)

TMS The Masonry Society
www.masonrysociety.org (303) 939-9700

TPI Truss Plate Institute
www.tpinst.org (703) 683-1010

TPI Turfgrass Producers International
www.turfgrasssoc.org (800) 405-8873 (847) 649-5555

TRI Tile Roofing Institute
www.tileroofing.org (312) 670-4177

UBC Uniform Building Code
(See ICC)

UL Underwriters Laboratories Inc.
www.ul.com (877) 854-3577

UNI Uni-Bell PVC Pipe Association
www.unibell.org (972) 243-3902

USAV USA Volleyball
www.usavolleyball.org (888) 786-5539 (719) 228-6800

USGBC U.S. Green Building Council
www.usgbc.org (800) 795-1747

USITT United States Institute for Theatre Technology, Inc.
www.usitt.org (800) 938-7488 (315) 463-6463

WASTEC Waste Equipment Technology Association
www.wastec.org (800) 424-2869 (202) 244-4700

WCLIB West Coast Lumber Inspection Bureau
www.wclib.org (800) 283-1486 (503) 639-0651

WCMA Window Covering Manufacturers Association
www.wcmanet.org (212) 297-2122

WDMA Window & Door Manufacturers Association
www.wDMA.com (800) 223-2301 (312) 321-6802

WI Woodwork Institute
(Formerly: WIC - Woodwork Institute of California)
www.wicnet.org (916) 372-9943

WMMPA Wood Moulding & Millwork Producers Association
(See MMPA)

WSRCA Western States Roofing Contractors Association
www.wsrca.com (800) 725-0333 (650) 938-5441

WWPA Western Wood Products Association
www.wwpa.org (503) 224-3930

REFERENCES
B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

DIN  Deutsches Institut für Normung e.V.  49 30 2601-0
     www.din.de

IAPMO International Association of Plumbing and Mechanical Officials  (909) 472-4100
    www.iapmo.org

ICC  International Code Council  (888) 422-7233
     www.iccsafe.org

ICC-ES ICC Evaluation Service, LLC  (800) 423-6587
     www.icc-es.org  (562) 699-0543

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

COE  Army Corps of Engineers  (202) 761-0011
     www.usace.army.mil

CPSC Consumer Product Safety Commission  (800) 638-2772
     www.cpsc.gov  (301) 504-7923

DOC  Department of Commerce  (301) 975-4040
     National Institute of Standards and Technology
     www.nist.gov

DOD  Department of Defense  (215) 697-2664
     http://dodssp.daps.dla.mil

DOE  Department of Energy  (202) 586-9220
     www.energy.gov

EPA  Environmental Protection Agency  (202) 272-0167
     www.epa.gov

FAA  Federal Aviation Administration  (866) 835-5322
     www.faa.gov

     www.gpo.gov

GSA  General Services Administration  (800) 488-3111
     www.gsa.gov  (202) 619-8925

HUD  Department of Housing and Urban Development  (202) 708-1112
     www.hud.gov

LBL  Lawrence Berkeley National Laboratory
     Environmental Energy Technologies Division
     http://eetd.lbl.gov
     (510) 486-4000
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University of Colorado Denver

OSHA  Occupational Safety & Health Administration
www.osha.gov (800) 321-6742

SD  Department of State
www.state.gov (202) 647-4000

TRB  Transportation Research Board
National Cooperative Highway Research Program
www.trb.org (202) 334-2934

USDA  Department of Agriculture
Agriculture Research Service
U.S. Salinity Laboratory
www.ars.usda.gov (202) 720-3656

USDA  Department of Agriculture
Rural Utilities Service
www.usda.gov (202) 720-2791

USDJ  Department of Justice
Office of Justice Programs
National Institute of Justice
www.ojp.usdoj.gov (202) 307-0703

USP  U.S. Pharmacopeia
www.usp.org (800) 227-8772
(301) 881-0666

USPS  United States Postal Service
www.usps.com (202) 268-2000

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other
Contract Documents, they shall mean the recognized name of the standards and regulations in the
following list. Names, telephone numbers, and Web sites are subject to change and are believed to be
accurate and up-to-date as of the date of the Contract Documents.

CFR  Code of Federal Regulations
Available from Government Printing Office
www.gpo.gov/fdsys (866) 512-1800
(202) 512-1800

DOD  Department of Defense
Military Specifications and Standards
Available from Department of Defense Single Stock Point
http://dodssp.daps.dla.mil (215) 697-2664

DSCC  Defense Supply Center Columbus
(See FS)

FED-STD  Federal Standard
(See FS)

FS  Federal Specification
Available from Department of Defense Single Stock Point
http://dodssp.daps.dla.mil (215) 697-2664

Available from Defense Standardization Program
CU Denver Building Convert Room 1110 & 1120 to City Center
University of Colorado Denver

www.dsp.dla.mil

Available from General Services Administration (800) 488-3111
www.gsa.gov (202) 619-8925

Available from National Institute of Building Sciences/Whole Building Design Guide (202) 289-7800
www.wbdg.org/ccb

MILSPEC Military Specification and Standards
(See DOD)

USAB United States Access Board (800) 872-2253
www.access-board.gov (202) 272-0080

USATBCB U.S. Architectural & Transportation Barriers Compliance Board (See USAB)

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00
SECTION 01 50 00 - 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.
   1. Nothing in this Section is intended to limit types and amounts of temporary work required, and no omission from this Section will be recognized as an indication by Architect/Engineer that such temporary activity is not required for successful completion of the Work. The use of alternative facilities equivalent to those specified is the Contractor's option, subject to Architect/Engineer's and University acceptance.
B. Related Requirements:
   1. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.
   2. Section 01 35 46 “Indoor Air Quality” for temporary facility work including HVAC, air filtration, moisture management, air filtration and dust control partitions required to comply with indoor air quality requirements during construction.

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, University's construction forces, Architect/Engineer, testing agencies, and authorities having jurisdiction.
B. Use Charges: As follows:
   1. For new construction: Arrange for and pay for water, sewer, electric power, steam and chilled water use charges for utility usage by all entities for construction operations.
   2. For renovations of existing facilities: Arrange for and University will pay for all use charges.
C. Temporary Metering: For all utility connection; sub-meter at point of connection to existing systems.
   1. Temporary utility meter must be approved by University Campus Energy Engineer.
   2. Meters shall be operational prior to any use of utility for temporary heating.

1.4 INFORMATIONAL SUBMITTALS
A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

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 isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
5. Other dust-control measures.

1.5 QUALITY ASSURANCE

A. General: Comply with governing regulations and utility company regulations and recommendations for the construction of temporary facilities including, but not necessarily limited to, code compliances, permits, inspections, testing, health, safety, pollution and environmental compliances.


D. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

E. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

F. Accessible Temporary Egress: Where temporary accessible egress from existing buildings or portions thereof is provided, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board’s ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

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 University’s acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.
PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide both new or used materials and equipment for temporary facilities, which are in substantially undamaged and serviceable condition. Provide types and qualities which are recognized in the construction industry as suitable for the intended use in each application. Comply with Utility Company requirements as applicable.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: N/A

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. Digital Camera: Minimum 12 megapixel; available in field office for use.

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, expand and modify facilities as required by progress of the Work.

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.

C. Use qualified workers for the installation of temporary facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, University, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services. Comply with requirements in Section 01 10 00 “Summary” for existing utility disruption procedures.

B. 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. Toilets: Use of University's existing toilet facilities is permitted on construction floor only.

2. Supply and maintain toilet tissue, paper towels, paper cups and similar disposable materials as appropriate for each sanitary facility, and provide appropriate waste paper containers for used materials.
3. At Contractor’s option, provide drinking water for construction personnel by either water-system-connected drinking fountains or by containerized tap dispensers with paper cups (or both).

C. Heating: Provide temporary heating 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.

1. HVAC Equipment: Unless University authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   a. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   b. Permanent HVAC System: If University authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air and exhaust grille in system and remove at end of construction. Clean and adjust HVAC system and put in new condition before Completion as required in Section 01 77 00 "Closeout Procedures".

D. 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.
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.

E. 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.

F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Provide temporary light to levels and as required by governing regulations but not less than minimum 5 foot-candle illumination in all areas accessible to workers during hours they are at the job; minimum 10 foot-candles for shop areas; 20 foot-candles or more where detailed or finishing work is being done, supplemented as may be required.
2. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
3. Install lighting for Project identification sign.
4. Where permanent light fixtures have been used for temporary lighting, supply temporary lamps and replace with new lamps at time of Completion.

G. Telephone Service: Provide temporary telephone service in Contractor’s field office and distribute to each work station.
1. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

B. 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.

C. Parking: Comply with requirements in Section 01 10 00 “Summary.”

D. Project Signs: Provide Project signs at locations indicated or directed. Unauthorized signs are not permitted.
   1. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
      a. Provide temporary, directional signs for construction personnel and visitors.
   2. Engage an experience sign painter to apply required colors and graphics in a neat and professional manner.
   3. Maintain and touchup signs so they are legible at all times.

E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 73 00 "Execution."
   1. Obtain necessary permits and approvals from City and County of Denver.
   2. Provide waste chutes as required in accordance with applicable laws and regulations.

F. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel. The selection of type, size and number of hoisting facilities is the solely the responsibility of the Contractor.
   1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

G. Temporary Elevator Use: Use of elevators is not permitted without prior written approval of the Architect/Engineer and University Project Manager.
   1. If so approved, only one designated elevator may be used subject to the requirements of “Existing Elevator Use” paragraph below.

H. Existing Elevator Use: When approved by University, one designated existing elevator may be used at no charge to Contractor or other subcontractors for transporting personnel, small tools, materials, and equipment. Comply with requirements of Section 01 10 00 “Summary” and the following:
   1. Contractor will not be granted exclusive use of the designated elevator. University personnel and staff will be permitted to use this elevator as their work duties require.
   2. Entire car is lined (floor, walls, ceiling) with 3/4 inch Fir plywood or equivalent.
   3. Total load carried does not exceed rated capacity of elevator.
4. No materials, equipment, trash, tools or other items too large to be readily moved into and out of the car may be carried in the elevator.
5. Before acceptance of the building, linings are removed; all exposed surfaces are in new condition; all controls, relays, other parts showing any wear have been replaced.
6. Entire elevator, including machinery, electrical components, doors, operators and controls shall be tested, adjusted, and put in new condition with specified warranties and maintenance to take effect at date of Completion Certificate.
7. Written clearance has been obtained from the Elevator Service Company stating that the installation is safe and complete for this use prior to using it.
8. The Contractor signs the Elevator Service Company's standard agreement and release forms for this usage and pays charges for maintenance, service, repairs, and reconditioning.

I. Existing Stair Usage: Use of University's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to University. At Substantial Completion, restore stairs to condition existing before initial use.
   1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

J. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

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. Protection of Work: Protect in-progress and completed work from damage or deterioration, other than normal weathering of exposed materials, through construction duration until completion, as appropriate and as recommended by manufacturer and Installer.
   1. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings. Protect finished floors and stairs from traffic, movement of heavy objects, and storage.
   2. Prohibit traffic and storage on waterproofed and roofed surfaces, on lawn and landscaped areas.
   3. Always protect excavation, trenches, and building, from damage from rain water, spring water, ground water, backing up of drains or sewers. Provide pumps, equipment, enclosures, to provide this protection.
   4. Remove protective coverings and materials at the appropriate time but no later than final cleaning operations.

C. 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 01 10 00 "Summary."

D. Security: Provide security program and facilities to protect the Work, existing facilities, and University operations and to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
   1. Coordinate with University Police.
   2. Provide lockable entrances and lock entrances at end of each work day.
3. After review and approval by University, install temporary enclosure around partially completed areas of construction.

4. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting wherever required to prevent accidents and losses.

F. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

G. Temporary Partitions: Provide floor-to-floor or floor-to-ceiling dustproof partitions terminating in dustproof floor or ceiling above to limit dust and dirt migration and to separate existing active elevator hoistways and other areas occupied by University from dust, fumes and noise in compliance with Section 01 35 46 “Indoor Air Quality” and the following:

1. Construct dustproof partitions with 5/8 inch gypsum wallboard with joints taped on occupied side, and 1/2 inch fire-retardant-treated plywood on construction operations side.

2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.

3. Insulate partitions to control noise transmission to occupied areas.

4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.

5. Protect air-handling equipment.

6. Provide walk-off mats at each entrance through temporary partition.

7. At elevator hoistway entrances not used during construction, seal openings with plastic sheet and duct tape.

H. 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. Fire Extinguishers: Minimum one per floor at or near useable exit.

   a. Provide additional extinguishers where convenient and effective for intended purpose.

   b. Comply with NFPA 10 to the extent applicable.

2. Strictly enforce site prohibition against smoking.

3. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

4. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Coordinate with University Project Manager to review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

5. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

6. Maintain unobstructed access to fire extinguishers, temporary fire protection facilities, stairways and other access routes for fighting fires.

7. Store combustible materials in containers in fire-safe locations.

8. Permanent Fire Protection System: Complete and make operational at earliest possible date. Instruct site personnel on use of permanent system.
3.5 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Comply with requirements in Section 01 35 46 “Indoor Air Quality Procedures.”

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.

1. Do not permit temporary offices and similar temporary or permanent spaces to be used as living quarters or for other unintended occupancies or uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

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.

C. Janitorial Services: Provide daily janitorial services for temporary offices, toilets, and similar areas at the project site. Require users of other temporary facilities to maintain clean and orderly premises.

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, unless Architect/Engineer requests that it be retained for a longer period of time. 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. University reserves right to take possession of Project identification signs.

2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION 01 50 00
SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 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.

B. Related Requirements:
   1. Section 01 21 00 "Allowances" for products selected under an allowance, if applicable.
   2. Section 01 23 00 "Alternates" for products selected under an alternate, if applicable.
   3. Section 01 25 00 "Substitution Procedures" for requests for substitutions.
   4. Section 01 42 00 "References" for applicable industry standards for products specified.
   5. Section 01 77 00 “Closeout Procedures” for submittal of project warranties.

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. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," 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.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: 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.
1. Requests for consideration of comparable products will only be entertained during bidding.
2. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
3. Architect/Engineer's Action: If necessary, Architect/Engineer will request additional information or documentation for evaluation of a comparable product request. Architect/Engineer will notify Contractor of approval or rejection of proposed comparable product.
   a. Form of Approval: Written Addendum.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options. The complete compatibility between the various choices available to the Contractor is not assured by the various requirements of the Contract Documents, but must be provided by the Contractor.

B. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturers or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.

D. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.

E. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data.
   1. Name of product and manufacturer.
   2. Model and serial number.
   3. Capacity.
   4. Speed.
   5. Ratings.
   6. Power characteristics (if applicable).
   7. UL label or compliance (if applicable).

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.
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. Such disclaimers and limitations do not relieve warranty requirements on Work that incorporates product nor do they relieve suppliers, manufacturers and subcontractors required to countersign special warranties with the Contractor.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to University.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for University.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time and Form: Comply with requirements in Section 01 77 00 "Closeout Procedures."

D. Warranty Requirements:

1. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
2. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
3. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents.
The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the University has benefited from use of the Work through a portion of its anticipated useful service life.

4. University's Recourse:

a. Written warranties made to the University are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the University can enforce such other duties, obligations, rights, or remedies.

b. Rejection of Warranties: The University reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

c. The University reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged, are asbestos free, 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.

3. University 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/Engineer will make selection.


6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product and provide only products previously approved during bid phase by written Addendum. The determination of equivalence is at the sole discretion of the Architect/Engineer who has no obligation to prove non-equivalence.

7. Mechanical and electrical equipment design and their space requirements are based on the first named item of the Section in which specified or that scheduled on the Drawings. If other than the first named or scheduled item listed for use is selected, modification to other elements of Work may be required. Show all such modification on shop drawings and submittals as appropriate. The cost of such modifications is solely the responsibility of the Contractor.

8. Where manufacturers are listed as acceptable for specific proprietary products but precise identification by model, series, or trade name is not specified, submit detailed product information for such products for Architect/Engineer's acceptance prior to ordering. Include specific requirements for modifications to other construction, including but not limited to, power and utility requirements, characteristics, capacities, size and locations. The cost of such modifications is solely the responsibility of the Contractor.

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 not be considered.

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.

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. If proposing a comparable product by another manufacturer, whether named or not, provide a custom product if manufacturer's standard product does not include salient features of the Basis-of-Design product indicated. 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.

6. **Contractor’s Option:** Where materials, products, systems or methods are specified to be selected from a list of options, subject to compliance with requirements, the choice of which material, method, product or system will be solely at the Contractor’s discretions. There will be no change in Contract Sum or Time because of such choice.

C. **Visual Matching Specification:** Where Specifications require "match Architect/Engineer's sample", provide a product that complies with requirements and matches Architect/Engineer's sample. Architect/Engineer'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 01 25 00 "Substitution Procedures" for proposal of product.

D. **Visual Selection Specification:** Where Specifications include the phrase "as selected by Architect/Engineer from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect/Engineer 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:** Prior to bid, Architect/Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect/Engineer will reject request:

   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 (Not Used)

END OF SECTION 01 60 00
SECTION 01 73 00 - 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:

2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of University-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

B. Related Requirements:

1. Section 01 10 00 "Summary" for limits on use of Project site and procedures related to utility interruptions.

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. Qualification Data: For land surveyor or professional engineer.

B. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.

C. Cutting and Patching Plan and Request: Submit plan and request describing procedures at least 21 calendar days prior to the time cutting and patching will be performed.

1. Submit request whenever cutting and patching operation affect:
   a. Work of the University or any separate contractor.
b. Structural value or integrity of any element of the Project.
c. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
d. Efficiency, operational life, maintenance or safety of operational elements.
e. Visual qualities of sight-exposed elements.
f. Cutting new openings in existing structural concrete walls, floors and suspended slabs.
g. Cutting new openings in existing roofs and roofing materials.
h. Cutting exterior walls.
i. Cutting into shafts.

2. Include the following information:

a. Extent: Describe reason for and extent of each occurrence of cutting and patching, including explanation of why cutting and patching operation cannot be reasonable avoided.
b. Changes to In-Place Construction: Describe cutting and patching methods and anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
c. Products: List products to be used for patching and firms or entities that will perform patching work.
d. Trades: Indicate trades and subcontractors who will perform the work.
e. Dates: Indicate when cutting and patching will be performed.
f. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

1) Include description of provisions for temporary services and systems during interruption of permanent services and systems.
2) Comply with requirements of Section 01 10 00 “Summary” related to existing utility and system interruptions.

g. Structural Elements: Where cutting and patching structural elements requires the addition of reinforcement, submit details and calculations signed and sealed by an Engineer registered in the State of Colorado. Indicate how new reinforcing will be integrated with original structure.

3. Limitations: Approval of cutting and patching request does not waive right of Architect/Engineer or University to later require complete removal and replacement of work found to be unsatisfactorily cut and patched.

D. Certified Surveys: Submit two copies signed by land surveyor or professional engineer.

E. Final Property Survey: Submit one electronic and two paper copies showing the Work performed and record survey data.

1. Include certified statement that lines and levels of the work comply with the requirements of the Contract Documents and listing authorized or accepted deviations, cross-referenced to Change Order number, where applicable.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
B. 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/Engineer of locations and details of cutting and await directions from Architect/Engineer before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying 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. Operational elements include but are not limited to the following:
   a. Primary operational systems and equipment.
   b. Fire separation assemblies.
   c. Air or smoke barriers.
   d. Fire-suppression systems.
   e. Mechanical systems piping and ducts.
   f. Control systems.
   g. Communication systems.
   h. Fire-detection and alarm systems.
   i. Conveying systems.
   j. Electrical wiring systems.
   k. Operating systems of special construction.

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. Other construction elements include but are not limited to the following:
   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Exterior curtain-wall construction.
   d. Sprayed fire-resistive material.
   e. Equipment supports.
   f. Piping, ductwork, vessels, and equipment.
   g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction exposed to the exterior or exposed in occupied spaces 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/Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

5. Hazardous Materials: Do not proceed with cutting and patching operations until University has examined existing construction for the presence of asbestos and/or lead-based coatings. Comply with requirements in Section 01 35 00 “Special Procedures.”

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.
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, use products for patching that comply with requirements in Division 01 Section “Sustainable Design Requirements.”

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 Architect/Engineer for the visual and functional performance of in-place materials.

C. 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 comply with Green Seal's 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 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, mechanical and electrical systems, and other construction affecting the Work. Notify University Project Manager and Architect/Engineer and obtain approval prior to disturbing, moving or penetrating soil.

1. Arrange for locating buried utilities including water and sewer lines within construction limits. Obtain location information and stake all known utilities prior to commencing construction activities.

   a. Contact Utility Notification Center of Colorado (UNCC), 1-800-922-1987, and comply with UNCC guidelines.

2. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

3. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility or University, as appropriate, 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.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect/Engineer according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect/Engineer promptly.

B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect/Engineer when deviations from required lines and levels exceed allowable tolerances. Record deviation which are accepted (i.e., not corrected) on record drawings in accordance with the requirements of Section 01 78 39 “Project Record Documents.”
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect/Engineer.

3.4 FIELD ENGINEERING

A. Identification: University will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect/Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect/Engineer before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor or professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."
3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated to the extent they are more explicit or stringent than requirements of the Contract Documents.

C. Install products at the time and under conditions, including weather that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Isolate each part of complete installation from incompatible material as needed to prevent deterioration.

E. 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.

F. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

G. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

H. 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.

I. 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, true and level as applicable, 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/Engineer.
   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.

J. Attachment to Concrete:
   1. No drilled inserts or powder-actuated fasteners are permitted in pre-stressed concrete except as specifically authorized by Contractor and carried out under the direct supervision of its Superintendent.
   2. Only those devices with a maximum controlled penetration of 3/4 inch or less will be permitted. Make holes through slabs by means of sleeves placed no closer than 2 inch from tensioning cables. Core drilling will not be permitted unless unavoidable and as specified for cutting and patching in this Section.
K. Joints: Unless indicated otherwise, make joints of uniform width. Where joint locations in exposed work are required but not indicated, arrange joints for the best visual effect. Confirm arrangement with Architect/Engineer before proceeding. Fit exposed connections together to form hairline joints.

L. 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. Responsibility: Provide cutting and patching work, including attendant excavation and backfill required to complete the Work or to:

1. Make components fit together properly.
2. Uncover portions of the Work to provide for installation of ill-timed work.
3. Remove and replace defective work or work not conforming to requirements of Contract Documents.
4. Remove samples of installed work as specified for testing.
5. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

C. 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.

D. Temporary Support: Provide temporary support of work to be cut.

E. 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.

F. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 10 00 "Summary."

G. 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, coordinate cutting and patching according to requirements in Section 01 10 00 "Summary."

H. 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 Sections where required by cutting and patching operations. Employ methods which will prevent settlement or damage to other work.

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.

I. 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, including tolerance, 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 eliminate evidence of patching and refinishing.

   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.

   b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

   a. Where patching occurs in a painted surface, 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.

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 and ensures thermal and moisture integrity of building enclosure.

J. 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 UNIVERSITY-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for University's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by University's construction personnel.

1. Construction Schedule: Inform University of Contractor's preferred construction schedule for University's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify University if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include University's construction personnel at preinstallation conferences covering portions of the Work that are to receive University's work. Attend preinstallation conferences conducted by University's construction personnel if portions of the Work depend on University'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.

2. Do not hold waste materials more than seven calendar days during normal weather or three calendar days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
   a. Use containers intended for holding waste materials of type to be stored.

B. Collection Point: Review location with University and obtain approval.

C. Site: Maintain Project site free of waste materials and debris.

D. Wind Blown Debris: Prevent spread of trash, debris, cartons, packing material, or other waste on or off Project site by wind.

E. Dust: Sprinkle dusty debris with water.

F. Packing Materials: Immediately after uncrating or unpacking materials or equipment, remove all crating, lumber, excelsior, wrapping or other like combustible materials from building to central collection facility.

G. 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.

H. 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.

I. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

J. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

K. 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 Section 01 74 19 "Construction Waste Management and Disposal."
L. 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.

M. 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.

N. 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.

O. Snow and Ice: Remove snow and ice from sidewalks adjacent to site and from access ways to building and construction site.

P. Streets: At frequency required by University and/or governing authority, clean adjacent and nearby streets of dirt resulting from construction operations.

3.9 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "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.

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

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
19. Electrical current.
20. High speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Misalignment.
25. Excessive weathering.
27. Improper shipping or handling.
28. Theft.
29. Vandalism.

END OF SECTION 01 73 00
SECTION 01 77 00 - CLOSEOUT PROCEDURES

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, including Notice of Completion and Final Inspection procedures.
2. Occupancy procedures, including Notice of Approval of Occupancy/Use and University Supplemental Notice of Occupancy and Use List.
3. Final Acceptance procedures, including Pre-Acceptance Checklist and University Supplemental Building/Project Acceptance List.
4. Inspections after completion.
5. Warranties.
6. Final cleaning.
7. Repair of the Work.

B. Related Requirements:

1. Section 01 32 33 "Photographic Documentation" for submitting final completion construction photographic documentation.
2. Section 01 73 00 "Execution" for progress cleaning of Project site.
3. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Section 01 79 00 "Demonstration and Training" for requirements for instructing University's personnel.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Notice of Completion.

C. Certified List of Incomplete Items: Final submittal at Final Acceptance.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.
1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 NOTICE OF COMPLETION AND SUBSTANTIAL COMPLETION PROCEDURES

A. Procedures and Submittals Prior to Notice of Completion: Complete and submit all of the following items prior to submitting Notice of Completion to Architect/Engineer. Include Contractor’s comprehensive list of items to be completed, corrected or not in compliance with the Drawings and Specifications.

1. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's preliminary punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
2. Building Inspection Record: Submit completed record with all required corrections noted.
4. Final Completion Schedule: Submit schedule for performing and completing all work indicated on the Contractor’ list of incomplete items.
5. Submit sustainable design documentation.
6. 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.
7. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
8. Submit test/adjust/balance records.

B. Final Inspection: Submit Notice of Completion to Architect/Engineer. Upon receipt, Architect/Engineer and University will review and if all items on the University Supplemental Notice of Completion Checklist are complete will, within the timeframe required by the Contract, schedule and make an inspection of the Project to determine whether the Work is substantially complete.

1. Final Punch List: Based on the inspection, Architect/Engineer will prepare a final punch list of work to be completed, work not in compliance with the Drawings or Specifications, and unsatisfactory work for any reason.
2. Re-inspection: If the cumulative number of items identified on the final punch list prevents a determination that the work is substantially complete, complete those items and when complete resubmit Notice of Completion. Upon receipt of resubmittal, Architect/Engineer and University will then schedule and make a re-inspection of the Project to determine whether the Work is substantially complete.

C. Notice of Substantial Completion: When inspection of the Work indicates that the Project is substantially complete and all other Contract provisions required for substantial completion have been satisfied, Architect/Engineer will issue a Notice of Substantial Completion (State Form SBP-07).

1.7 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.
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CLOSEOUT PROCEDURES

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor or as approved by Architect/Engineer.

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/Engineer.
   d. Name of Contractor.
   e. Page number.

4. Submit list of incomplete items in the following format:
   a. MS Excel and PDF electronic file. Architect/Engineer will return annotated file.

1.8 OCCUPANCY PROCEDURES

A. Procedures and Submittals Prior to Occupancy: Complete and submit all items on both State Form SBP-01 “Notice of Approval of Occupancy/Use” and University Supplemental Notice of Occupancy and Use List.

1.9 FINAL ACCEPTANCE PROCEDURES

A. Procedures and Submittals Prior to Final Acceptance: Complete and submit all items on both State Form SBP-05 “Pre-Acceptance Checklist” and University Supplemental Building/Project Acceptance List.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 business days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect/Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect/Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.10 SETTLEMENT AND FINAL PAYMENT

A. Submit and complete all of the following as a condition precedent to settlement and final payment:

1. All guarantees and warranties.
2. All statement to support local sales tax refunds, if any.
3. Three (3) sets of operation and maintenance manuals.
4. One (1) set of as-built Contract Documents showing all job changes.
5. All demonstration and training completed in accordance with Section 01 79 00.
6. All punch list items documented as complete.

B. Final Certificate of Payment: Submit in accordance with the requirements of Section 01 29 00 “Payment Procedures.”
1.11 INSPECTIONS AFTER COMPLETION

A. Warranty/Guarantee Inspections: During the warranty period, accompany Architect/Engineer and University Representative, and participate in inspection(s) of the Project to identify defective and deficient work at intervals and as required by the Contract.

B. List of Deficient or Defective Work: Within 10 business days of inspection, Architect/Engineer will provide Contractor with a list of items requiring correction.

C. Remedial Work: Upon receive of itemized list, immediately correct and remedy deficiencies and defects in a manner satisfactory to the Architect/Engineer and University.

1.12 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties to the Architect/Engineer prior to advertisement of the Notice of Contractor's Settlement. If the Notice of Acceptance designates a commencement date for warranties other than the date of Notice of Acceptance for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

B. Partial Occupancy: When a designated portion of the Work is completed and occupied or used by the University, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect/Engineer within fifteen (15) calendar days of completion of that designated portion of the Work.

C. Special Warranties: When a special warranty is required to be executed by the Contractor, or the Contractor and a Subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the University through the Architect/Engineer for approval prior to final execution. Refer to individual Specification Sections for specific requirements for special warranties.

D. Form of Submittal: Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Number of Copies: Two.
2. Bind warranties and bond in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
3. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
4. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
5. 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.

E. Provide additional copies of each warranty to include in operation and maintenance manuals.

F. List of Extended Warranties: Provide a comprehensive list of all manufacturers’ standard and special warranties with duration greater than one year after Notice of Acceptance. Organize list into an orderly sequence based on table of contents of the Project Manual.
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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 comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.
2. Do not use sweeping compounds on concrete floors that will leave residue affecting finish floor materials.

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 immediately prior to Occupancy for entire Project or for a designated portion of Project:

   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Remove snow and ice to provide safe access to building.
   f. Clean exposed exterior and interior finishes to a dirt-free condition, free of grease, dust, stains, films, fingerprints, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   h. Sweep concrete floors broom clean in unoccupied spaces.
   i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
   j. Power scrub and power buff resilient flooring surfaces, tile and fluid-applied flooring.
   k. 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.
   l. Remove labels that are not permanent.
   m. Wipe surfaces of mechanical and electrical equipment, elevator equipment where applicable, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
   n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.


q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

r. Clean food service equipment to sanitary condition acceptable for intended food service use and approved by authority having jurisdiction.

s. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 01 50 00 "Temporary Facilities and Controls." Prepare written report.

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, refinish damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged 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 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 burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

3.3 ATTACHMENTS

A. Samples of the following forms are appended to this Section for reference following End of Section 01 77 00:

1. University of Colorado Denver | Anschutz Medical Campus Supplemental Notice of Occupancy and Use List.

2. University of Colorado Denver | Anschutz Medical Campus Supplemental Building / Project Acceptance List.

END OF SECTION 01 77 00
Supplemental Notice of Occupancy and Use List

Project Name & Number: CU Denver Building Convert Room 1110 & 1120 to City Center PN# 18-115993
Contractor: 

In addition to completing Notice of Approval of Occupancy / Use (SBP-01), the following items must be completed before Occupancy is approved.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Date Completed</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Final and formal address posted on the building entries.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. A copy of the Contractor’s in-progress red line “as-built” drawings has been given to BMO representative &amp; a 2nd copy is provided for Projects plan room. This is to include landscape drawings showing irrigation installation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Maintenance, operations and spare parts manuals on all installed equipment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Notice of Partial Substantial Completion concerning roles/ responsibilities of University and Contractor for security, maintenance, heat, utilities reviewed and accepted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Manufacturer maintenance, operations and spare parts manuals for fixtures, mechanical, electrical and plumbing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Hardware-maintenance, operations and spare parts manuals for doors &amp; locks, including roll up doors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Warranty Dates and Contact list for all Contractors and Suppliers given to BMO.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Transfer utility account from Contractor to Facilities Operations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Site plan to include first floor main isolation locations and plans for each floor to include main utility shutoffs, for utilities to include water, electrical, steam, sewer, fuel supply, telecom, fiber optic and gasses, identified on a set of drawings.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. If Commissioning Report is completed, BMO has reviewed/ commented, including electrical, plumbing, mechanical/ HVAC.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. All Contractor provided equipment has new filters &amp; construction filters removed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Not Used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Elevator equipment rooms insulated and space conditioned for control system requirements.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. FSS has been provided with copy of Building Department testing and inspection report for window washing equipment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Roof walking pads to access equipment are installed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. PM to communicate to fire department via Life Safety Officer that building has transitioned to BMO. Alarms at Anschutz Medical Campus report to University Police Dispatch and at Downtown report to designated monitoring company.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Training for BMO and FSS on installed equipment and systems is completed.</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Equipment keys and locks transitioned to Operations, including fire panels, electrical panels, directories and generator panels. Construction cores removed and replaced with permanent cores.</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>Access control pathways and junction boxes for installed doors, gates, loading docks and roof access complete. <strong>All wiring and hardware completed and electronic security access controls in place and tested by University Electronic Security.</strong></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>EH&amp;S is provided, as applicable for project, with fume hood certification, water testing certification, hazardous waste compliance certification, radiation compliance certification, BSL3 certification, and all other specialty equipment certification.</td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>PM notifies University Risk Management that project is transferring to University and notifies Contractor that it can eliminate Builders Risk Insurance.</td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>Not Used</td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>Not Used</td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>Elevator tools, including hand tools, computer, proprietary and operational software is received and confirm 1-year service from date of acceptance.</td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>All computers and software required in drawings and specs. are received, including for BAS, Energy and Lighting, Fuel Systems, and Power Management, and any specialty software and alarm codes for operating systems.</td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>For all areas to be transferred to University, all waste and debris removed; floor and wall surfaces clean and in good repair; ceiling surfaces clean, unmarked, in place; site, including sidewalks, cleared of debris and construction equipment; and roof is clear of all materials and debris.</td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>Water chlorination and testing complete and provided by PM to Chief Building Official and BMO via BMO Rep.</td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>Toilet accessories are in place that meet custodial contract.</td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>Trash receptacles outside the building are in place</td>
<td></td>
</tr>
</tbody>
</table>

---

**University Project Manager**<br>(sign & print name) <br>**Date**<br>**University BMO Rep.**<br>(sign & print name) <br>**Date**

**University FSS Rep**<br>(sign & print name) <br>**Date**<br>**University Downtown Rep. (If Necessary)**<br>(sign & print name) <br>**Date**

*Highlighted items are not the responsibility of Contractor but PM and BMO Rep must ensure these are completed and operational prior to occupancy and use.*

Mark N/A by item if it is not applicable to project 3.1.12
Supplemental Building / Project Acceptance List

**Project Name & Number:** CU Denver Building Convert Room 1110 & 1120 to City Center PN# 18-115993

**Contractor:**

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In addition to completing Pre-Acceptance Checklist (SBP-05), the following items must be completed before Final Acceptance.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Date Completed</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Review State Buildings Pre-Acceptance check list &amp; Notice of Approval of Occupancy / use form with BMO rep &amp; confirm agreement with status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*2. Establish list of post construction change orders &amp; track separately from basic project until items are complete – call it Phase 2 to avoid delay on basic project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. O &amp; M Manuals given to BMO Representative and BMO Archivist (2 hard copies and 1 electronic total)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*4. Record Documents – a hard copy of plans and specifications are provided for plan room &amp; given to BMO &amp; electronic auto cad &amp; specs are given to Archive Officer (Art Steinman) this is to include landscape drawings showing irrigation installation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*5. Final Site Walk is completed with University Grounds Supervisor. Drain barriers are removed and storm drains cleared. MS4 storm water plan, CDPHE permits, and evidence of final closeout received by Project Manager and all copied to University Engineering Division.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>**/**6. <strong>Move-related work items complete including physical move, tours (occupants &amp; police), mail, phone &amp; electrical hook ups for equipment &amp; furniture systems complete &amp; freezers enrolled in University freezer program.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. If exterior work is applicable: Landscape – Include a walk through with University Grounds for 1) new &amp; established 1-year service date; 2) existing damaged landscape is repaired; and 3) irrigation – zone control test is complete.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Attic stock, matches spec. requirements, is located in secured location, and is inventoried.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Electrical system one line diagram framed and mounted in electrical room.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Spare fire suppression heads in cabinets and tool: cabinet in main electrical room includes one complete set of spare fuses for major equipment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Contractor keys issued by University BMO returned to University Key Shop via PM/BMO Rep.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Interior Finishes Binder given to the University Project Manager: (Two hard copies)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Not Used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Not Used</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
15. Safety grating in pipe chases in place.

16. Signs in place including monument sign, building exterior and site signage and building interior signage.

17. All applicable reports, including Air Emission reports; Sewer Reports, including for process diverters, traps and collection tanks; Fuel Storage Tank and Detection reports; and Water System tests and reports provided to BMO via PM and BMO Rep.

18. Not Used

19. Not Used

20. Not Used

21. Not Used

22. If commissioning is included for project, Commissioning Agent certification is received by BMO via PM and BMO Rep.

<table>
<thead>
<tr>
<th>University Project Manager</th>
<th>Date</th>
<th>University BMO Rep.</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>(sign &amp; print name)</td>
<td></td>
<td>(sign &amp; print name)</td>
<td></td>
</tr>
<tr>
<td>University FSS</td>
<td>Date</td>
<td>University Downtown Rep (if necessary)</td>
<td>Date</td>
</tr>
<tr>
<td>(sign &amp; print name)</td>
<td></td>
<td>(sign &amp; print name)</td>
<td></td>
</tr>
</tbody>
</table>

*Warranty dates are not subject to completion of these items by contract
**Highlighted items are not the responsibility of Contractor but PM and BMO Rep must ensure these are completed and operational prior to occupancy and use.
Mark N/A by item if it is not applicable to project
3.1.12
SECTION 01 78 23 - 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. Systems, subsystems, and equipment operation and maintenance manuals.
3. Product maintenance manuals.
4. Emergency manuals.
5. Framed operating and maintenance instructions.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Section 01 91 13 "General Commissioning Requirements" for verification and compilation of data into 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. Schedule: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 30 calendar days before commencing demonstration and training. Architect/Engineer will return copy with comments.

1. Correct or revise each manual to comply with Architect/Engineer's comments. Submit copies of each corrected manual within 15 calendar days of receipt of Architect/Engineer's comments and prior to commencing demonstration and training.

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/Engineer.
a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
b. Compile entirely from documents with searchable text.
c. Enable inserted reviewer comments on draft submittals.

2. Paper copies. Assemble in accordance with the requirements of this Section.
a. Submit three final copies, one to be retained by the Architect/Engineer and two to be retained by the University.

C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 30 calendar days before commencing demonstration and training. Architect/Engineer will return copy with comments.

1. Correct or revise each manual to comply with Architect/Engineer's comments. Submit copies of each corrected manual within 15 calendar days of receipt of Architect/Engineer's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Intent: Prepare data in form of an instructional manual for use by University personnel.

B. 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.

C. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of University.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect/Engineer.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect/Engineer that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

D. 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.
E. 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.

F. Manufacturers’ Data: Where manuals contain manufacturers’ standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

G. 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.

H. 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 and enable OCR (optical character recognition) to provide searchable text.
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.

I. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in minimum 1 inch and maximum 2 inch thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
   b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 SYSTEMS, SUBSYSTEMS AND EQUIPMENT OPERATION AND MAINTENANCE MANUALS

A. General: Provide operation and maintenance manuals where indicated in individual Specification Section and the following:

1. Heating, ventilating and air-conditioning equipment and systems.
2. Plumbing equipment and systems.
3. Special piping equipment and systems.
4. Electrical distribution systems.
5. Standby generator systems.
6. Communications systems.
7. Fire alarm and detection systems.
8. Underground sprinkler systems.
10. Food service equipment.
11. Elevators.
12. Other special construction and conveying systems.

B. Operation Content: In addition to requirements in this Section, include operation data required in individual Specification Sections.

1. Additional Operation Content Required:
   b. Performance and design criteria if Contractor has delegated design responsibility.
   c. Operating standards.
   d. Operating procedures.
   e. Operating logs.
   f. Wiring diagrams.
   g. Control diagrams.
   h. Piped system diagrams.
   i. Precautions against improper use.
   j. License requirements including inspection and renewal dates.

2. Descriptions: Include the following:
   a. Product name and model number. Use designations for products indicated on Contract Documents.
   b. Manufacturer's name.
   c. Equipment identification with serial number of each component.
   d. Equipment function.
   e. Operating characteristics.
   f. Limiting conditions.
   g. Performance curves.
   h. Engineering data and tests.
   i. Complete nomenclature and number of replacement parts.
3. Operating Procedures: 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. Instructions on stopping.
   f. Normal shutdown instructions.
   g. Seasonal and weekend operating instructions.
   h. Required sequences for electric or electronic systems.
   i. Special operating instructions and procedures.

4. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.


C. Maintenance 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.

1. Source Information: Provide the following information in a list for each product included in manual:
   a. Name, address, and telephone number of Installer or supplier and maintenance service agent.
   b. Name, address, and telephone number of local source for supply of replacement parts.
   c. Name, address, and telephone number of maintenance contractor, where appropriate.
   d. Cross-reference Specification Section number and title.
   e. Drawing or schedule designation or identifier where applicable.

2. Manufacturers’ Maintenance Documentation: Manufacturers’ maintenance documentation including the following information for each component part or piece of equipment:
   a. Standard maintenance instructions and bulletins.
   b. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   c. Identification and nomenclature of parts and components.
   d. List of items recommended to be stocked as spare parts.

3. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   a. Test and inspection instructions.
   b. Troubleshooting guide.
   c. Precautions against improper maintenance.
   d. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   e. Aligning, adjusting, and checking instructions.
   f. Demonstration and training video recording, if available.

4. 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.
a. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
b. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

5. 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.

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

7. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   a. Include procedures to follow and required notifications for warranty claims.
   b. Include information sheet covering proper procedures in event of failure and instances which might affect validity of warranties and bonds.

2.3 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Separate into two manuals: one for exterior moisture protection products and those exposed to weather and one for interior products. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: Provide the following information for each product included in manual:
   1. Name, address, and telephone number of Installer or supplier and maintenance service agent.
   3. 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.
   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.
2.4  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.
5.  Power failure.
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 University'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.

2.5  FRAMED OPERATING AND MAINTENANCE INSTRUCTIONS

A.  All mechanically and electrically operated equipment and controls shall be provided with legible and complete wiring diagrams, schematics, operating instructions, and pertinent preventative maintenance instructions in a sturdy frame with clear glass or plastic cover. Use non-fading, permanent media.

B.  Locate frames in the same room or service enclosure as equipment, or in the nearest mechanical or electrical room.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 23
SECTION 01 78 39 - 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. Record Samples.
5. Miscellaneous record submittals.

B. Related Requirements:

1. Section 01 73 00 "Execution" for final property survey.
2. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
3. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. General: Submit record drawings with duplicate original transmittal letters containing:

1. Date.
2. Project title and number.
3. Contractor’s name and address.
4. Certification that each document as submitted is complete and accurate.
5. Signature of authorized representative of the Contractor.

B. Record Drawings: Submit copies of record Drawings as follows:

1. Submit three paper-copy sets of marked-up record prints, two copies will be retained by the University and one copy retained by the Architect/Engineer.
2. Submit three paper-copy sets and three digital copies on CD of electronic files for all delegated-design submittals. Two copies will be retained by the University and one copy retained by the Architect/Engineer.

C. Record Specifications: Submit three paper copies of Project's Specifications, including addenda and contract modifications. Two copies will be retained by the University and one copy retained by the Architect/Engineer.
D. Record Product Data: Submit three paper copies of each submittal. Two copies will be retained by the University and one copy retained by the Architect/Engineer.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

E. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit three paper copies of each submittal. Two copies will be retained by the University and one copy retained by the Architect/Engineer.

F. Interior Finishes Binder: Three copies. Two copies will be retained by the University and one copy retained by the Architect/Engineer.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to 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 acceptable 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.
   f. Mark using line types and symbols conforming to Contract Documents.

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 referenced to permanent surface improvements.
   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 referenced to visible and accessible features of structure.
   j. Locations of concealed valves, dampers, controls, balancing devices, junction boxes, cleanouts, and other items requiring access or maintenance.
   k. Changes made by Change Order.
   l. Changes made following Architect/Engineer's written orders.
   m. Details not on the original Contract Drawings.
   n. Field records for variable and concealed conditions.
1. 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-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark additional information important to University that was either shown schematically or omitted from original Drawings.

6. Note Change Order numbers, and similar identification, where applicable.

B. Record Delegated Design Electronic Files: For all delegated design submittals, including but not limited to landscape irrigation, fire alarm and fire sprinkler plans, prepare electronic files in full compliance with University of Colorado Denver | Anschutz Medical Campus Guidelines and Design Standards, Part 1.0, Paragraph “Drawing Production Standards.”

C. Identification: Identify and date each record Drawing: include the designation "PROJECT RECORD DRAWING” in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Architect/Engineer.
   e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

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

1. Give particular attention to substitutions, selection of options, and similar information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Note related Change Orders where applicable.

4. Maintain one complete copy of all Addenda, Change Orders and other written change documents in printed form during construction.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Directory: Include record Product Data directory organized by Specification Section number and title.
C. **Product List:** Update and record any changes to Product List submitted in accordance with Section 01 60 00 “Product Requirements”, including any changes to brand, model, subcontractor, or Installer so that final list reflects materials, equipment and systems incorporated into the Work.

2.4 **RECORD SAMPLES**

A. Prior to Final Acceptance, meet with University Project Manager and Architect/Engineer at site to review and identify which submitted samples maintained during the progress of the Work are to be transmitted to the University.

B. Deliver selected samples to storage area identified by University.

C. **Finishes Binder:** Three-ring notebook or notebooks, organized by Specification Section number, providing a listing and description of all material finishes on the Project and including a minimum 6 inch by 6 inch sample thereof to accompany the description. Accompany each material selection indicated with the following:

1. Manufacturer and product name.
2. Pattern name and number, as applicable.
3. Color name, as applicable.
4. Any additional information required to order replacement product.

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.

1. Include manufacturer’s certifications, field test record, copies of permits, licenses, certifications, inspection reports, releases, notices, receipts for fee payments and similar documents.

B. Directory: Include miscellaneous record submittals directory organized by Specification Section number and title.

**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 revisions to project record documents as they occur; do not wait until end of Project. Update at least weekly.

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/Engineer’s and University’s reference during normal working hours.

**END OF SECTION 01 78 39**
SECTION 01 79 00 - 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 University's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.

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. Include outline for each training module.

B. Qualification Data: For instructor, demonstrating qualifications and ability to instruct on maintenance and care of system, equipment and products.

C. Schedule of Demonstration and Training: Prepare a schedule in tabular form of all demonstration and training required in individual Specification Sections including:

1. Specification Section number and title.
2. Description of required demonstration and training.

D. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training. Manufacturer's sales staff is not acceptable.

B. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to demonstration and training.
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: 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.
   g. A tour of the installation identifying the location of all system components.

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.
n. Sequence of operation.

5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   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.
   f. Product support/service model.
   g. Purchasing of replacement parts.

9. Instruction specific to Instrumentation and Controls, Electrical Gateway, Network Lighting Controls, or any other new technology that is integrated with another system: Include the following:
   a. Overview and theory.
   b. Wiring diagrams, including the one line diagram.
   c. Creation, editing, and programming of the point database.
   d. Integration topology and platform for communication.
   e. Graphics packages and touch screens for the system.
   f. Alarms and diagnostics.
   g. Reporting functions dynamically and historically.
   h. Remote access to the system.
   i. Database back-up and maintenance.
   j. Replacement and re-programming of replacement parts.
   k. Point type and functionality for each type of point.
   l. Programming.
   m. Point/object editing.
   n. Loop tuning.
   o. Help files and other troubleshooting documentation.
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p. Instruction is given by the staff that setup the integration.

C. Operation and Maintenance Manuals: Provide appropriate Operation and Maintenance manuals in each training session so that the detail drawings and maintenance activities are outlined and discussed for each application.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct University's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. University will furnish Contractor with names and positions of 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. Coordinate schedule for all training with University Project Manager and provide the following:

   a. Minimum 3 weeks notification.
   b. Training matrix in calendar format.
   c. Training outline for each session.

2. Do not schedule training until equipment has been started up, commissioned, and is currently operating in its normal condition.

3. Do not schedule overlapping training sessions.

4. Schedule training sessions for a maximum of 4 hours per day; afternoons preferred.

5. Provide separate training session on each system for operational/maintenance groups and user groups.

6. Training sessions will be cancelled and rescheduled unless the following documentation is received:

   a. Instruction qualifications.
   b. Evidence that equipment has been started up, commissioned, and is currently operating in its normal condition.
   c. Operation and Maintenance manuals.

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. Travel, Room and Board: Coordinate any out-of-state training with the University Project Manager.

E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.
### DEMONSTRATION SCHEDULE

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 11 00</td>
<td>VISUAL DISPLAY SURFACES</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to adjust, operate, and maintain motor-operated, sliding visual display units.</td>
</tr>
<tr>
<td>12 21 13</td>
<td>HORIZONTAL LOUVER BLINDS</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to adjust, operate, and maintain systems.</td>
</tr>
<tr>
<td>12 24 13</td>
<td>ROLLER WINDOW SHADES</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to adjust, operate, and maintain motor-operated roller shades.</td>
</tr>
<tr>
<td>13 20 00</td>
<td>SPECIAL PURPOSE ROOMS</td>
<td>Engage a factory-authorized service representative to train and provide training video to University’s maintenance personnel to operate, adjust, maintain, and repair controlled environmental rooms and cold rooms.</td>
</tr>
<tr>
<td>23 00 00</td>
<td>HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)</td>
<td>Schedule instructional meetings for The University of Colorado Denver Facilities Operations maintenance personnel on the proper operation and maintenance of mechanical systems. Provide the project manager a minimum of 5 days notice prior to any testing.</td>
</tr>
<tr>
<td>23 05 13</td>
<td>MOTORS</td>
<td>Engage a factory-authorized representative to train the University’s representative for 2 hours for each variable frequency drive installed. Training includes startup, shutdown, emergency operation, maintenance and servicing.</td>
</tr>
<tr>
<td>23 08 00</td>
<td>COMMISSIONING OF HVAC</td>
<td>Engage the commissioning authority to provide a customized one to two day training class for the university’s engineering personnel in problem solving techniques including the review of mechanical system design as a whole, integrated unit, unique qualities of the installed mechanical system, insights into how to solve system-wide, multi-faceted problems, and identify a variety of resources to assist with problem solving.</td>
</tr>
<tr>
<td>23 09 00</td>
<td>INSTRUMENTATION AND CONTROLS</td>
<td>Engage a factory-authorized trained representative to conduct a minimum of 1-hour on-site training course and an additional 1-hour on-site training course per 25,000 sq. ft. for designated University personnel.</td>
</tr>
<tr>
<td>23 21 23</td>
<td>PUMPS</td>
<td>Engage a factory-authorized service representative to train a University Representative for 2 hours of instruction for each pumping system provided.</td>
</tr>
<tr>
<td>26 00 00</td>
<td>ELECTRICAL</td>
<td>Engage a factory-authorized service representative to train the University’s Operations personnel a minimum of 8 hours for each system. Provide an additional minimum of 4 hours for any electrical gateway or networked lighting controls.</td>
</tr>
<tr>
<td>28 31 00</td>
<td>FIRE DETECTION AND ALARM</td>
<td>Engage a factory-authorized service representative to train the University’s Operations personnel a minimum of 8 hours for each system.</td>
</tr>
</tbody>
</table>

**END OF SECTION 01 79 00**
SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements:
   1. Concrete mixtures for concrete slabs and concrete deck fill shall be normal weight and shall have a water-cement ratio of 0.45 or less.
   2. Provide sheet vapor retarder directly below concrete at all slabs-on-grade.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Materials:
   1. Portland Cement Replacement: Fly ash to reduce portland cement up to 40 percent is acceptable for concrete mixtures for footings, foundation walls, walls, columns, and other vertical surfaces; not permitted for slabs.

B. Sheet Vapor Retarder: ASTM E 1745, Class A, 15 mil, except with maximum perm rating of 0.01. Include manufacturer's recommended adhesive or pressure-sensitive tape. Provide at all slabs-on-grade.

C. Penetrating Liquid Floor Treatments: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces. Provide at loading docks, receiving areas, and other similar exposed concrete floor surfaces subject to heavy, hard-wheeled devices.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Floor and Slab Finishes:
   1. Trowel: Surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or thin-film-finish coating system.

3.2 FIELD QUALITY CONTROL

A. Testing: By The University-engaged agency.

B. Special Inspections: By The University-engaged special inspector.

C. Cost of Testing: To be included as part of Project budget.

END OF SECTION 03 30 00
SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Performance Requirements:
   1. Deflection Limits: L/360 typical except L/720 at backup wall framing supporting exterior masonry veneer.

B. Engineering design of cold-formed metal framing by Contractor.

1.2 DEFINITIONS

A. Cold-formed metal framing includes:
   1. Exterior and interior load-bearing wall framing.
   2. Exterior non-load-bearing wall framing.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, G90, metallic coated.

B. Load-Bearing Wall Framing: Standard C-shaped, punched steel studs and U-shaped, unpunched track.
   1. Minimum Steel Thickness: 0.054 inch (16 gauge).

   1. Minimum Steel Thickness: 0.054 inch (16 gauge).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten framing by welding or screw fastening.
   1. Load-Bearing Wall Stud Spacing: 16 inches maximum.

END OF SECTION 05 40 00
SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements
   1. Wood studs not permitted. If required and approved by the University Project Manager provide fire-retardant-treated lumber.
   2. Select composite wood products with low emissions based on ASTM testing standards E1333-10.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wood Products, General:
   1. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness.

B. Wood-Preservative-Treated Materials:
   1. Preservative Treatment: AWPA U1; use Category UC2
      a. Preservative Chemicals: Containing no arsenic or chromium.
   2. Application: Items indicated and the following:
      a. Items in contact with roofing or waterproofing.
      b. Items in contact with concrete or masonry.

C. Fire-Retardant-Treated Materials:
   1. Interior Type A unless otherwise indicated.
   2. Application: All miscellaneous carpentry.

D. Miscellaneous Lumber:
   1. Dimension Lumber: Construction or No. 2 grade any species.

E. Plywood Backing Panels: Exterior, AC, fire-retardant treated.

F. Fasteners: Hot-dip galvanized steel where exposed to weather, in ground contact, in contact with treated wood, or in area of high relative humidity.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 06 10 53
SECTION 06 41 00 - ARCHITECTURAL WOOD CASEWORK

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements:
   1. Wood cabinets not permitted in wet areas.
   2. Comply with AWI standard; grade as indicated.

PART 2 - PRODUCTS

2.1 WOOD-VENEER-FACED ARCHITECTURAL CABINETS

A. WOOD CABINETS FOR TRANSPARENT FINISH
   1. Grade: AWI Premium preferred; AWI Custom acceptable based on Project cost.
   2. Type of Construction: Frameless.
   3. Cabinet and Door and Drawer Front Interface Style: Flush overlay.
   4. Wood for Exposed Surfaces:
      a. Species: per drawings or as approved by the University Project Manager.
      c. Veneer Matching: Book match veneer leaves and center-balance match within panel face.
         1) Cabinet veneers in each space from a single flitch.
   5. Cabinet Interior (not exposed to view): Thermoset decorative panels.

B. MATERIALS
   1. Cabinet Hardware:
      a. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening.
      b. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
      c. Heavy Duty Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
      d. Shelf Rests: BHMA A156.9, B04013; metal; for normal duty cabinet shelving.
      e. Catches: Magnetic catches, BHMA A156.9, B03141.
      f. Drawer Slides: BHMA A156.9, B05091.
         1) Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
         2) Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
         3) File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
         4) Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches high and 24 inches wide.
         5) Keyboard Slides: Grade 1HD-100; for computer keyboard shelves.
         6) Trash Bin Slides: Grade 1HD-200; for trash bins not more than 20 inches high and 16 inches wide.
      g. Door Locks: BHMA A156.11, E07121; where indicated and approved by the University Project Manager.
      h. Drawer Locks: BHMA A156.11, E07041; where indicated and approved by the University Project Manager.
      i. Track for Sliding Doors:
      j. Offset Carrier for Sliding Doors:
      k. Cam Locks: Basis-of-design product; National, C8103.
      l. Grommets for Cable Passage through Countertops: 2-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.
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m. Exposed Hardware Finishes: Satin chromium plated; BHMA 626 (US26D).

C. SHOP FINISHING
1. Grade: Same grade as woodwork.
2. Extent: All cabinets shop finished.

2.2 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. WOOD CABINETS FOR OPAQUE FINISH
1. Grade: AWI Premium preferred; AWI Custom acceptable based on Project cost.
2. Type of Construction: Frameless.
3. Cabinet and Door and Drawer Front Interface Style: Flush overlay.
4. Laminate Cladding for Exposed Surfaces:
   a. Horizontal Surfaces: Grade HGS.
   b. Postformed Surfaces: Grade HGP.
   c. Vertical Surfaces: Grade HGS.
5. Cabinet Interior: Thermoset decorative panels.

B. MATERIALS
1. Cabinet Hardware: Same as for wood-veneer-faced architectural cabinets.

2.3 PLASTIC-LAMINATE COUNTERTOPS

A. Materials:
1. High-Pressure Decorative Laminate Grade: HGS.
3. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 06 41 00
SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements:
   1. R-value of roofs, walls, and floors shall be not less than the prescriptive requirements of ASHRAE 90.1, latest edition. Lower R-values are not permitted even if International Energy Code Compliance can be demonstrated using the energy model approach.
   2. Wherever possible continuous insulation is encouraged.
   3. Provide WUFI moisture analysis of all exterior wall and roof assemblies to determine and justify the appropriate placement of a vapor retarder within the assembly.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Insulation:
   1. Extruded-Polystyrene Board: Type IV, 25 psi.
   3. Unfaced Glass-Fiber Blanket: Type I.
   4. Closed-Cell Spray Polyurethane Foam: Type II, minimum density of 1.5 lb/cu. ft.

B. Vapor Retarders: Reinforced polyethylene.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 07 21 00
SECTION 07 42 13 - METAL WALL PANELS

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements:
1. Design all metal wall panels as cladding only. Provide complete weather-resistive and air-barrier membrane over solid sheathing with drainage plane and weeps behind the cladding.
2. Metal wall panel type, configuration, profile, etc. to be approved by the University Project Manager.

B. Performance Requirements:
1. Deflection Limits: 1/180 of span.
2. Air Infiltration: Not more than 0.06 cfm/sq. ft when tested at 6.24 lbf/sq. ft.; ASTM E 283.
3. Water Penetration: None, when tested at 6.24 lbf/sq. ft.; ASTM E 331.

PART 2 - PRODUCTS

2.1 FORMED METAL WALL PANELS

A. Exposed-Fastener or Concealed-Fastener, Lap-Seam Metal Wall Panels
1. Material: Metallic-coated steel or aluminum.
2. Exterior Finish: Three-coat fluoropolymer.

2.2 METAL PLATE WALL PANELS

A. Metal Plate Wall Panels:
1. Material: Tension-leveled, smooth aluminum sheet, 0.125 inch thick minimum.
2. Exterior Finish: Three-coat fluoropolymer.
3. Attachment Assembly: Rainscreen principle.

2.3 METAL COMPOSITE MATERIAL WALL PANELS

A. Metal Composite Material Wall Panels
1. Material: Aluminum faced; 0.157 inch (4mm) thick; fire-retardant core.
2. Exterior Finish: Three-coat fluoropolymer preferred.
3. Attachment Assembly: Rainscreen principle.

2.4 INSULATED METAL WALL PANELS

A. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels
2. Exterior Finish: Three-coat fluoropolymer.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 07 42 13
SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL
1.1 NOT USED

PART 2 - PRODUCTS
2.1 JOINT SEALANTS

A. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
   1. Use: For joints in restrooms, janitor’s closets, and other areas subject to continued moisture exposure or high humidity, including door frames and all static joints in ABSL and animal facilities.
   2. Products: Subject to compliance with requirements, provide one of the following:
      a. BASF Building Systems; Omniplus.
      b. Dow Corning Corporation; 786 Mildew Resistant.
      c. GE Advanced Materials - Silicons; Sanitary SCS1700.
      d. Tremco Incorporated; Tremsil 200 Sanitary.

B. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
   1. Use: For interior door frames and other static joints.
   2. Products: Subject to compliance with requirements, provide one of the following:
      a. BASF Building Systems; Sonolac.
      c. Pecora Corporation; AC-20+.
      d. Tremco Incorporated; Tremflex 834.

C. Acoustical Joint Sealant: Nonsag, paintable, nonstaining latex.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Pecora Corporation; AC-20 FTR.
      b. USG Corporation; SHEETROCK Acoustical Sealant.

D. Cylindrical Joint-Sealant Backing: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

PART 3 - EXECUTION
3.1 INSTALLATION
   1. NOT USED

END OF SECTION 07 92 00
SECTION 08 00 00 - OPENINGS

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements:
   1. Design doors to be larger than the width of the largest piece of equipment to be installed in the space.
   2. Provide either hollow metal or glazed aluminum storefront for all exterior doors; wood doors not permitted.
   3. Provide either hollow metal, glazed aluminum or solid-core wood for interior doors.
   4. Provide 3’-0” by 8’-0” doors typical; wider doors are permitted if required by function and approved by the University Project Manager.
   5. Prepare doors and frames to receive security hardware including door switch monitoring devices. Refer to 28 13 00 – Access Control.
   6. All replacement windows must be approved by the University Campus Architect and the University Project Manager.
   7. Provide solid doors for vermin control at all OLAR doors.
   8. All-glass doors are prohibited for interior use. Provide wood stile and rail doors with glass.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Doors:
   1. Provide all fire-rated doors and frames with an approved UL label.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 08 00 00
SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements:
   1. Curtain wall framing systems preferred, storefront glazing systems acceptable only for ground floor glazing not greater than 10 feet in height and for punched or ribbons windows located not greater than 60 feet above grade. All storefront glazing systems must be provided with extruded sills and end dams.
   2. All aluminum-framed storefront glazing members shall be thermally-broken.
   3. Narrow and medium stile doors are not permitted.
   4. Sliding entrance doors are not permitted.

B. Performance Requirements:
   1. Delegated Design: Contractor to design aluminum-framed systems.
   2. Structural Performance:
      a. Wind Loads: Project specific.
   3. Deflection of Framing Members:
      a. Deflection Normal to Wall Plane: Limited to L/175.
      b. Deflection Parallel to Glazing Plane: Limited to L/360 or 1/8 inch, whichever is smaller.
   4. Air Infiltration: 0.06 cfm/sq. ft. when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
   5. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
   6. Water Penetration under Dynamic Pressure: No water penetration when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
   7. Condensation Resistance: No condensation shall form on interior surfaces of aluminum glazing at exterior and interior winter design temperature and relative humidity.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer TrifabVG-451T or comparable products by one of the following:
   1. EFCO Corporation.
   2. Oldcastle BuildingEnvelope.
   3. United States Aluminum.
   4. YKK AP America Inc.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer.

B. Steel reinforcement as required for loads.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members.
2. Glazing System: Retained mechanically with gaskets on four sides.
4. Nominal Size: 2-inch-wide by 4-1/2-inch-deep.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors:
2. Door Design: Wide stile.
   a. Stiles must be wide enough to accommodate rim type metal exit hardware.

B. Entrance Door Hardware:
1. Butt hinges; pivots not permitted on new installations.
2. Closers: surface mounted.
3. Reinforce doors to accept magnetic locking hardware, door position switches and request-to-exit devices for control by security system.
4. Locks: Where provided cylinders must accept small format (7-pin) interchangeable cores.

2.5 ALUMINUM FINISHES

A. Aluminum Finishes: High-performance organic (three coats).

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 08 41 13
SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY
A. Section Includes
   1. Finish hardware for doors as scheduled and specified herein, including:
      a. Mechanical hardware for swinging wood and hollow metal doors.
      b. Mechanical hardware for swinging aluminum storefront and glass entrances.
      c. Field verification, preparation, and modification of existing doors and frames to receive new finish hardware
   2. Electro-mechanical devices and access control components as specified herein.
B. Related Sections
   1. Provide hardware complying with division 01 section “references” as well as the following publications to the extent referenced within this specification.
      a. Division 08 Section: “Hollow Metal Doors and Frames”
      b. Division 08 Section: “Wood Doors”
      c. Division 08 Section: “Aluminum-Framed Entrances and Storefronts”
      d. Division 28 Section: “Access Control”
      e. Division 28 Section: “Intrusion Detection”

1.02 REFERENCED STANDARDS
A. Provide hardware in accordance with the following standards in addition to those specified in Division 01 Section “References.”
   2. Builders Hardware Manufacturer’s Association (BHMA)
      a. ANSI/BHMA A156.3: Exit Devices, 2008 edition
      b. ANSI/BHMA A156.4: Door Controls - Closers, 2008 edition
      d. ANSI/BHMA A156.18: Materials and Finishes, 2006 edition
   3. Door and Hardware Institute (DHI)
      e. Sequence and Format for the Hardware Schedule, 2001 edition
   4. National Fire Protection Association (NFPA)
      a. NFPA 80: Standard for Fire Doors and Other Opening Protectives, edition as adopted by local AHJ.
      b. NFPA 105: Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives, edition as adopted by local AHJ.
      c. NFPA 252: Standard Methods of Fire Tests of Door Assemblies, edition as adopted by local AHJ

1.03 ADMINISTRATIVE REQUIREMENTS
A. Coordination
   1. 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.
      a. Coordinate blocking for wall stops and other surface-applied hardware with Division 06 Section “Rough Carpentry.”
b. Coordinate hardware locations and templating with the appropriate Division 08 door and frame sections.
c. Coordinate conduit, raceways, wiring, and connection as required for electrical and pneumatic hardware items with the appropriate electrical, access control, intrusion detection, and fire alarm sections.
d. Fire Rated Openings: Coordinate with door and frame manufacturer to ensure that total opening complies with requirements for fire doors.

B. Pre-installation Meetings
1. Upon approval of hardware schedule and wiring diagram submittals and before hardware installation, conduct a pre-installation meeting complying with Division 01 Section “Project Management and Coordination.”
2. Meeting attendees shall include the owner’s representative, architect, contractor, hardware supplier, hardware installer, other affected trades, and manufacturer representative(s) for locks, exit hardware, operators, and closers.
3. Discuss the installation of continuous hinges, locksets, door closers, exit devices, electromechanical finish hardware, and finish hardware. Coordinate installation between trades.
   a. Discuss special installation requirements.
   b. Inspect and discuss electrical rough-in and other preparatory work performed by other trades.
   c. Review sequence of operation for each electrified door opening.
   d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   e. Review required testing, inspecting, and certifying procedures
4. At the meeting, distribute installation manuals, templates, wiring diagrams, and approved hardware schedule submittals to each attendee.
5. Notify participants at least five (5) working days before meeting.

C. Keying Conference
1. Upon approval of hardware schedule and before ordering locking hardware and key system, conduct a keying meeting complying with Division 01 Section “Project Management and Coordination.”
2. Meeting attendees shall include the owner, owner’s security consultant, construction manager, contractor, architect, and hardware supplier’s Architectural Hardware Consultant.
3. Discuss key system requirements and incorporate decisions made during the meeting into the keying schedule submittal.
   a. Review each locking function and determine degree of security required at each opening.
   b. Review function of building, flow of traffic, and purpose of each area.
   c. Determine degree of security at each opening.
   d. Determine requirements for future expansion.
   e. Discuss requirements for shipping and delivery of keys [and permanent cores].
   f. Discuss requirements to interface new cylinders/cores with owner’s existing key system.

1.04 SUBMITTALS
A. General
1. Provide submittals in accordance with Division 01 Section “Submittal Procedures.”
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.
   a. Submittals submitted without the above certification seal shall be marked incomplete and returned.
4. Submittal sequence: Submit product data, hardware schedule, samples, and qualification data concurrently. Coordinate submission of finish 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
1. Submit manufacturer’s technical product data for each item of finish hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. 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 finish hardware, as well as procedures and diagrams. Coordinate the final finish hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of finish hardware.
2. Check specified hardware for suitability and adaptability to details and surrounding conditions. Indicate unsuitable or incompatible items and proposed substitutions.
   a. Format schedule complying with the vertical format in DHI's "Sequence and Format for the Hardware Schedule" publication. Double space entries, and number and date each page. Use same scheduling sequence and door numbers as in the Contract Documents
   b. Include the following information:
      1) Numerical door index indicating door number, heading number, and architect’s specified hardware set number.
      2) Identification number, location, hand, fire rating and material of each door and frame.
      3) Type, style, function, size, quantity, and finish of each finish hardware item. Include description and function of each lockset and exit device.
      4) Complete designations of every item required for each door or opening including name and manufacturer.
      5) Fastenings and other pertinent information.
         a) Where universal-type closers are scheduled, indicate the application method to be used for installation at each door (e.g. regular arm, parallel arm, or top jamb).
      6) Location of each finish hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
      7) Explanation of abbreviations, symbols, and codes contained in schedule.
      8) Mounting locations for finish hardware.
      9) Door and frame sizes and materials.
     10) Description of each electrified finish hardware function, including location, sequence of operation, and interface with other building control systems.
          a) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit; loss of power; fire alarm sounds.
     11) List of related door devices specified in other Sections for each door and frame.
   c. Submit, with the hardware schedule, a list of lead times for hardware items.

D. Keying Schedule
1. By Owner.

E. Manufacturer’s Templates
1. After final approval of the hardware schedule, provide templates for doors, frames, and other work specified to be factory prepared for the installation of finish hardware. Check shop drawings of other work to ensure that adequate provisions are made for locating and installing finish hardware to comply with indicated requirements. Provide additional templates, template lists, hardware schedules, and product information to other trades upon request.

1.05 CLOSE OUT SUBMITTALS
A. General
1. Upon substantial completion, provide two (2) copies of the closeout submittals complying with Division 01 Section “Close Out Submittals.”
B. Operation And Maintenance Data
1. Provide operation and maintenance manuals that include the following for each hardware item:
   a. Project information including contact information for architect, contractor, supplier, installer, Architectural Hardware Consultant, and local representative of each hardware manufacturer
   b. Complete information on care, maintenance, adjustment, repair and replacement of parts, and preservation of finishes
   c. Product data, templates, installation information, service manual, and parts lists.
   d. Copy of final hardware and keying schedules and wiring diagrams for each opening connected to either 120V or low voltage power. Edit schedules and diagrams to reflect “As installed” conditions.

C. Warranty Documentation
1. Provide information required for warranty service or replacement of each hardware item including:
   a. Warranty certificates from manufacturer stating warranty period and conditions, complying with warranty requirements specified herein.
   b. Copy of manufacturer’s order confirmation or original packing slip with manufacturer’s original order number, date of manufacture, and ship date.

1.06 QUALITY ASSURANCE
A. Qualifications
1. Supplier Qualifications: Supplier shall have documented experience in the supply of finish hardware for five (5) years or for three prior projects similar in scope, size, and quality. Supplier shall have an Architectural Hardware Consultant, complying with the requirements specified herein, available to properly handle, detail, and service hardware in a satisfactory manner. Architectural Hardware Consultant shall be available during the course of the work to consult with contractor, architect, and owner about finish hardware and keying.
   a. Supplier shall be a certified direct distributor and be a full sales and service organization for the manufacturer(s) listed.
   b. Supplier shall have warehousing facilities within 50 miles of the project site.
2. Installer Qualifications: Installer shall have documented experience in the installation of finish hardware for five (5) years or for three prior projects similar in scope, size, and quality.
3. Manufacturer Sourcing Qualifications: Obtain each type of finish hardware (hinges, latch & locksets, exit devices, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
   a. Provide electrified hardware from same manufacturer as mechanical finish 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.
4. Architectural Hardware Consultant Qualifications: A person who is certified by DHI as an Architectural Hardware Consultant (AHC) or Architectural Openings Consultant (AOC) and is enrolled in the DHI Continuing Education Program. Consultant shall be experienced in providing consulting services for finish hardware installations that are comparable in material, design, and extent indicated.

B. Fire Door Assemblies
1. Provide finish hardware for fire rated openings that complies with NFPA 80 and the requirements of the AHJ. Provide only items of finish 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.
   a. 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.”
   b. Provide proper latching hardware, non-flaming door closers, approved bearing type hinges, and required gasketing if not furnished with door or frame.
C. Smoke And Draft Control Door Assemblies
   1. Where smoke and draft control door assemblies are required, provide finish hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Marking And Packaging
   1. Package hardware items manufacturer’s standard packaging, clearly marked with hardware set number correlating to finish hardware schedule and architect’s door number.

B. Delivery And Acceptance
   1. Coordinate with construction schedule and deliver packaged hardware items to place of installation (e.g. project site, fabrication shop). Upon delivery, inspect and inventory finish hardware. Immediately notify supplier of defective or missing items.
   2. 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 complying with Division 01 Section “Product Storage and Handling Requirements” for finish 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.

1.08 EXISTING CONDITIONS

A. Where new hardware components are scheduled for application to existing construction or where modifications to existing finish hardware are required, field verify existing conditions and coordinate installation of finish hardware to suit opening conditions and to provide for proper operation.

1.09 WARRANTY

A. General Warranty
   1. Warrant finish hardware against defects in material and workmanship as set forth in Division 01 Section “Warranties.”
   2. Special warranties specified herein shall not deprive owner of other rights specified in the contract documents, but shall be in addition to, and run concurrent with, other warranty requirements.

B. Special Warranty
   1. Provide a written warranty, executed by the product manufacturer agreeing to repair or replace components of finish hardware that fail in materials or workmanship within the specified warranty period.
      a. Failures include, but are not limited to, the following:
         1) Structural failures including excessive deflection, cracking, or breakage.
         2) Faulty operation of operators and finish hardware.
         3) Deterioration of metals, metal finishes, and other materials beyond normal wear.
      b. Warranty Period: Two (2) years from date of Substantial Completion, except for:
         1) Mortise Locksets: Ten (10) years from date of substantial completion
         2) Exit Devices: Five (5) years from date of substantial completion
         3) Door Closers: Thirty (30) years from date of substantial completion
         4) Electrified Hardware Items: One (1) years from date of substantial completion

PART 2 - PRODUCTS

2.01 MANUFACTURERS
DOOR HARDWARE

A. Substitutions submitted, no later than 10 business days prior to bid and complying with Division 01 Section “Substitutions” requirements will be reviewed for conformance to basis of design. Substitutions found in compliance will be approved by bid addendum.

2.02 MATERIALS

A. General
1. Manufacturer’s Name Plate: Do not use manufacturers’ products that have manufacturer’s name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.
   a. Manufacturer’s identification will be permitted on rim of lock cylinders only.
2. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer’s standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.
3. Provide hardware manufactured to conform to published templates generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

B. Fasteners
1. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Furnish stainless steel (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including “prepared for paint” surfaces to receive painted finish.
2. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Use through bolts only as indicated in this section unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

C. Hinges
1. Acceptable Products:
   a. McKinney: TA2714 T4A3786
2. Requirements:
   a. Screws: Provide Phillips flat-head screws complying with the following requirements:
      1) For metal doors and frames install machine screws into drilled and tapped holes.
      2) For wood doors and frames install wood screws.
      3) For fire-rated wood doors install #12 x 1-1/4-inch flat, threaded-to-the-head steel wood screws.
   b. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
      2) Interior Doors: Non-rising pins.
      3) Tips: Flat button and matching plug, finished to match leaves.
   c. Number of Hinges: At non-rated openings, provide two hinges for each door leaf 60 inches or less in height and one additional hinge for each 30 inches of additional height or portion thereof. At fire rated openings, provide no less than three ball bearing hinges for each door leaf 86 inches or less in height and one additional hinge for each 30 inches of additional height or portion thereof.
   d. Hinge Width: Where applied trim or closer templating require hinge widths wider than 4-1/2 inches, provide minimum width required. Otherwise, provide hinges 4-1/2 inches in width.
   e. Hinge Height: Provide hinges 5 inches in height where door leaf exceeds 3’0 in width or where door is a high-use door utilizing panic or push/pull hardware. Otherwise, provide hinges 4-1/2 inches in height.
   f. Hinge Weight: Provide heavy weight hinges where door leaf exceeds 3’0 in width, at exterior doors, where swing clear hinges are scheduled, where door utilizes panic or push/pull hardware, and where armor plates are scheduled. Otherwise provide standard weight hinges.
D. Operating Door Trim
  1. Door Bolts
     a. Acceptable Products:
        1) Rockwood: 557/555
        2) Trimco: 3915/3917
     b. Requirements:
        1) Provide bolt model recommended by manufacturer for door material type.
        2) Provide 1 inch throw stainless steel bolt with 12 inch length unless otherwise scheduled in the sets.

E. Electric Strikes
  1. Acceptable Products:
     a. HES 1006 Series
  2. Requirements:
     a. Provide electric strikes that are continuous duty rated without the use of external rectifiers.
     b. Provide electric strikes with function (fail safe, fail secure) and power requirements as scheduled.
     c. Where scheduled, provide electric strikes with monitor switches.

F. Locks And Latches
  1. General:
     1) Lock Chassis: Shall be made from steel, with locking spindles of stainless steel.
     2) Latch Bolt: Shall be constructed of stainless steel with 3/4 inch throw on mortise locks and 1/2 inch throw otherwise. Latch to be deadlocking on keyed functions.
     3) Lever Trim: Shall be pressure cast brass, bronze, zinc, or steel with wrought rose design.
     4) Fire Rating: Lock shall be listed for up to 3 hours.
     5) Strike Plates: Provide ANSI 4-7/8 inch strike plates. At pairs of doors, provide strike with 7/8 inch flat lip. At single doors, provide round-lipped strike with lip length as required to minimally clear jamb and trim. Provide dust box at each strike location.

  2. Mortise Locks
     a. Acceptable Products:
        1) Sargent: 8200 Series, LW1L Trim Design
        2) No Substitution, Match existing facility standard
     b. Requirements:
        1) ANSI Grade: BHMA/ANSI A156.13, Series 1000, Grade 1.
        2) Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
        3) Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
        4) Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

G. Cylinders And Cores
  1. Acceptable Products:
     a. Assa Abloy – Purchase from Owner
  2. Requirements:
     a. All locks and exit devices to be furnished less cylinder.
     b. Purchase all cylinder housings and cores from Owner.
     c. Keys: Provide cylinder manufacturer’s standard keys. Keys shall be shipped separate from cores directly to owner’s representative.

H. Exit Devices
  1. Acceptable Products:
     a. Sargent: 88 Series
     b. No Substitution, Match existing facility standard
2. Requirements:
   a. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit or Fire Exit Hardware. Cylinders: Refer to “KEYING” article, herein.
   b. Exit Devices: Touchpad type, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
   c. Touchpad: Extend minimum of one half of door width. Match exit device finish or provide compatible finish. Provide compression springs in devices, latches, and outside trims or controls, tension springs also acceptable.
   d. Provide devices with deadlatching feature for security and for future addition of alarm kits and other electrical requirements.
   e. Provide manufacturer's standard strikes.
   f. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
   g. Where exit device(s) are provided for fire rated door, provide with fire listing and label indicating “Fire Exit Hardware.” If device is mounted on wood doors, provide sex nuts and bolts.
   h. Provide less dogging at non-fire rated exit devices.
   i. Provide UL labeled fire exit hardware for fire rated openings.

I. Mechanical Door Closers
1. General:
   a. Valves: Closers shall have separate valves for latch speed, main speed, and back check. Valves shall be staked to prevent accidental removal. Internal Pressure Relief Valves (PRVs) are prohibited. Provide closers at exterior doors with “Advanced Variable Backcheck” for further protection from wind and abuse forces.
   b. Provide the appropriate closer body, handing, and brackets to mount closer inside the building on the least-public side of the door.
      1) Where closers are to be mounted parallel arm, provide with heavy duty arms.
      2) Where closers are to be mounted regular arm and the opening can otherwise be opened to 180 degrees, provide closer with the appropriate special templating to allow 180 degree door swing. Where a special template is not available for 180 degree swing, provide closer arm with integrated stop.
   c. Integrated Stop Closer Arms: Where a closer with integrated stop is required, provide the appropriate closer and arm as follows:
      1) Parallel arm with spring-cushioned stop arm: Provide where door is otherwise able to open to 95 degrees and requires a parallel arm mount closer.
      2) Parallel arm with dead stop arm: Provide where door is obstructed from opening to 95 degrees and requires a parallel arm mount closer.
      3) Regular arm with push side surface-mounted overhead stop: Provide where door closer should mount on pull side of door.
   d. Hold Open Arms: Provide closer arms with mechanical hold-opens as scheduled.
   e. Provide closers with any special templates, brackets, plates, or other accessories required for interface with header, door, wall, and other hardware. Provide closers with screw packs containing thru-bolts, machine screws, and wood screws.
   f. Closers shall be provided with all-weather fluid and shall not require readjustment from 120 degrees F to -30 degrees F. Fluid shall be non-flaming and shall not fuel door or floor covering fires. Upon request, provide data indicating thermal properties of fluid.
   g. Closers shall close and latch door when adjusted to meet accessibility requirements for door opening force: 8.5 lbs at exterior doors, 5 lbs at interior doors, and 15 lbs at labeled fire doors.
   h. 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.

2. Heavy Duty Door Closers:
a. Acceptable Products:
   1) LCN: 4040XP
   2) No Substitution, Match existing facility standard

b. Requirements:
   1) ANSI Grade: BHMA/ANSI A156.4, Grade 1.
   2) Closer Construction: Closer shall have cast iron body with 1-1/2 inch steel piston, double heat treated pinion, 5/8 inch bearing journals, and full complement needle or caged ball bearings. Closer shall be adjustable from sizes 1 through 6.
   3) Provide closers with spring size adjustment dial for ease of adjusting.

J. Architectural Door Trim
1. Protection Plates and Edge Guards
   a. Acceptable Products:
      1) Rockwood: K1050
      2) Trimco: K Series
   b. Requirements:
      1) Provide .050 inch thick stainless steel protection plates with height as scheduled. Plate shall have four beveled edges and countersunk screws. Provide plate with width as follows:
         a) Pairs of Doors: Provide plate to be 1 inch less door width.
         b) Single Doors: Provide plate to be 2 inches less door width on push side, pull side mounted plates to be 1 inch less door width.

2. Door Stops and Holders
   a. Acceptable Products:
      1) Rockwood: 403
      2) Trimco: 1270
   b. Requirements:
      1) Provide stops and holders as indicated in the HW sets.
      2) Where wall bumpers are scheduled, provide concave rubber bumper where the adjacent lever trim incorporates a push-button. Otherwise, provide convex rubber bumpers.
      3) Locate wall mounted door stops at the appropriate height and location to properly contact protruding door trim.

K. Overhead Stops And Holders
1. Acceptable Products:
   a. Rockwood: 9 Series
2. Requirements:
   a. Provide overhead stops and holders as scheduled, sized per manufacturer’s recommendations based on door width.
   b. Provide concealed overhead stops with adjustable jamb bracket.
   c. Where possible without conflicting with other hardware, mount surface overhead stops on least public side of door.
   d. Provide stops with any special templates, brackets, plates, or other accessories required for interface with header, door, wall, and other hardware.

L. Weatherstrip And Gasket
1. General:
   a. Provide weather strip and gasketing as scheduled.
   b. Size weather strip and gasket to provide a continuous seal around opening and at meeting stiles.
   c. 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.
2. Perimeter Seals
   a. Acceptable Products:
      1) Zero: 188
CU Denver Building Convert Room 1110 & 1120 to City Center
University of Colorado Denver

2) National Guard: 5050
3) Pemko: S88

3. Astragals, Meeting Stiles, and Mullion Seals
   a. Acceptable Products:
      1) Zero: 117S
      2) National Guard: 5060B
      3) Pemko: S77D
   b. Requirements
      1) Where overlapping astragals are scheduled on exterior doors, provide with thru-bolts.
      2) Where overlapping astragals are scheduled on out-swinging doors, provide for mounting on the pull-side of the active leaf. Otherwise, provide for mounting on the push-side of the inactive leaf.

M. Miscellaneous Hardware
   1. Silencers
      a. Acceptable Products:
         1) Rockwood: 608
         2) Trimco: 1229A
      b. Requirements:
         1) Where indicated on single openings, provide 3 each grey rubber silencers on lock jamb.
         2) Where indicated on paired openings, provide 2 each grey rubber silencers on header.

2.03 FINISHERS

A. Match items to the manufacturer's standard color and texture finish for the latch and locksets (or push-pull units if no latch or locksets).

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

D. The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted.
   1. Brushed Chrome and/or Stainless Steel Appearance
      e. Weatherstrip and Gasket: Clear Anodized Aluminum finish.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify conditions of walls, flooring, doors, frames, and hardware are satisfactory for installation of hardware.
   1. Prior to installing doors and hardware, wash down of masonry and painting or staining of doors and frames shall be completed.
   2. Verify that walls have blocking behind wall mounted stop locations. Verify that flooring does not interfere with door or hardware operation.
   3. Ensure that frames are installed plumb, square, and true. Verify that doors and frames are properly sized and handed and are correctly prepared for hardware installation.
   4. Verify function, quantity, type, hand, and finish of hardware to be installed with the approved hardware schedule.
5. Verify that electrical rough-in is complete and correctly located for each door.
B. Conditions that do not allow proper installation of hardware shall be corrected before proceeding.

3.02 INSTALLATION
A. General
1. Install door hardware in accordance with manufacturer’s recommended procedures and methods.

B. Hardware Mounting Heights
1. Mount door hardware units at heights indicated, as follows, unless otherwise indicated or required to comply with governing regulations.
   b. Custom Steel Doors and Frames: DHI’s "Recommended Locations for Builders’ Hardware for Custom Steel Doors and Frames."
   c. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

C. Clearances
1. Install doors, both rated and non-rated, in accordance with NFPA 80 requirements for door clearances as follows:
   a. 1/8 inch between door and frame head and jambs for wood doors
   b. 3/16 inch between door and frame head and jambs for metal doors
   c. 1/8 inch at meeting stiles of pairs of doors.
   d. 3/4 inch undercut maximum.

3.03 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.

3.04 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.

3.05 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.

END OF SECTION 08 71 00
SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements:
   1. At a minimum provide high-performance, low-e, heat-strengthened, insulating-glass units at all exterior glazed openings.
   2. At all exterior glazed openings, provide glazing with low reflectivity.
   3. Select and configure glazing to support daylighting wherever possible and appropriate.

B. PERFORMANCE REQUIREMENTS
   1. Engineering design of glass by Contractor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Glass Manufacturers: Subject to compliance with requirements, provide products from one of the following:
   1. PPG Industries.
   2. Viracon.
   3. AFG Industries, Inc.
   5. Pilkington North America.

B. Fire-Protection-Rated Glazing Manufacturers: Subject to compliance with requirements, provide products from one of the following:
   1. InterEdge, Inc., a subsidiary of AFG Industries, Inc.
   4. Safti First; SuperLite C/P.
   5. Schott North America, Inc.

2.2 MONOLITHIC-GLASS TYPES

A. Clear float glass: Use at all interior door and window locations not required to be safety glass or fire-protection-rated.

B. Clear fully tempered float glass at all interior door and window locations where safety glass is required.

C. Polished wired glass permitted where fire-protection-rated glass is required.

2.3 INSULATING-GLASS TYPES

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190. Use at all exterior glazed openings.
2.4 FIRE-PROTECTION-RATED GLAZING TYPES

A. Fire-Protection-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies. Permitted in lieu of polished wired glass where fire-protection-rated glass is required.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 08 80 00
SECTION 09 00 00 - FINISHES

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Performance Requirements:
   1. Fire-Test-Response Characteristics:
      a. Surface-Burning Characteristics: As determined by testing per ASTM E 84.
         1) Flame-Spread Index: 25 or less.
         2) Smoke-Developed Index: 25 or less.
         3) Fuel Contributed Index: 15 or less.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PREPARATION OF CONCRETE TO RECEIVE MOISTURE SENSITIVE FLOORING

A. Prepare all concrete substrates to receive moisture sensitive floor finishes including, but not limited to, resilient sheet floor, linoleum flooring, resilient tile flooring, resinous matrix terrazzo flooring, resinous flooring, sheet carpeting and tile carpeting, according to ASTM F 710 and the following:
   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 manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate pH is between 7.0 and 9.0.
   4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
      a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 80 percent relative humidity level measurement.

B. Provide moisture vapor emissions and alkalinity control system to all concrete substrates that fail alkalinity and/or moisture testing.

END OF SECTION 09 00 00
SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements:
   1. Space studs at 16 inches on center maximum.
   2. Where interior partitions do not extend to the underside of structure, brace to structure at 4 feet on center.

B. Performance Requirements:
   1. Partitions, General: Provide metal framing systems of base-metal thickness and spacing capable of limiting lateral deflections when subjected to a 5 psf uniform lateral load to the following:
      a. \( L/240 \) where supporting gypsum board only.
      b. \( L/360 \) where supporting plaster or ceramic tile finishes.
      c. \( L/720 \) where providing backup to stone or masonry.
   2. Suspended Ceiling Design Requirements: Provide metal framing systems of base-metal thickness and spacing capable of limiting ceiling deflections to \( L/360 \) when subjected to a minimum 4 psf uniform load or the actual weight of ceiling hung materials, whichever is greater.
   3. Engineering design of non-structural metal framing by Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Framing for Framed Assemblies:
   1. Steel studs and runners: 0.033-inch-thick (20 gauge) minimum.
   2. Dimpled steel studs and runners: 0.025-inch-thick minimum, with structural properties equivalent to 0.0329-inch-thick steel studs.

PART 3 - EXECUTION (Not Applicable)

3.1 INSTALLATION

A. Secure with fasteners or proper crimping tools; do not weld.

END OF SECTION 09 22 16
PART 1 - GENERAL

1.1 Not Used

PART 2 - PRODUCTS

2.1 MATERIALS

A. Interior Gypsum Board:
   1. Gypsum board, Type X: Provide 5/8 inch thick, typical unless noted otherwise.
   2. Abuse-resistant gypsum board: Provide at service corridors.
   3. Moisture- and mold-resistant gypsum board. Provide at all high humidity areas.

B. Tile-Backing Panels:
   1. Glass-mat, water-resistant backing board.

C. Trim Accessories:

D. Auxiliary Materials
   1. Sound attenuation blankets.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Finishing Gypsum Board Assemblies:
   1. Levels of Gypsum Board Finish: At a minimum, Level 4 finish; comply with recommendations in GA-214-10, “Recommended Levels of Gypsum Board Finish.”

END OF SECTION 09 29 00
SECTION 09 30 00 - TILE

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements:
   1. Provide tile selection as approved by the University Campus Architect through the University Project Manager.
   2. Provide waterproof membrane under all tile installations above occupied space.

PART 2 - PRODUCTS

2.1 TILE PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   Soho Studio Corp
   1. Daltile; Division of Dal-Tile International Inc.
   2. United States Ceramic Tile; a Roca Tile Group company.

B. Wall Tile: Glazed wall tile.
   1. Size: 3 by 6 inches polished glass crystal cement, as noted on the Finish Plan.

C. Other Tile: Only as approved by the University Campus Architect through the University Project Manager.

D. Trim Shapes:
   1. Wainscot cap: Surface bullnose.
   2. Base: Coved base.
   3. Outside Corners: Surface bullnose.
   4. Inside Corners:
   5. Jamb: Surface bullnose where tile projects from jamb.

2.2 ACCESSORY MATERIALS

A. Thresholds: Aluminum.

B. Waterproof Membrane: Chlorinated polyethylene sheet; fluid applied membranes are not permitted.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide The Noble Company, NobleSeal TS or comparable product.

C. Crack Isolation Membrane: Chlorinated polyethylene sheet.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide The Noble Company, NobleSeal CIS or comparable product.

D. Metal base and edge strips: Where tile trim shapes are not available use metal accessories:
   1. Coved Metal Base: Subject to compliance with requirements, provide Schluter-DILEX-EHK or comparable product.
   2. Coved Metal Inside Corner: Subject to compliance with requirements, provide Schluter-DILEX-EHK or comparable product.
   3. Edge Protection: Subject to compliance with requirements, provide Schluter-SCHIENE or comparable product.
   4. Outside Corner: Subject to compliance with requirements, provide Schluter-QUADEC or comparable product.
5. Wainscot Cap: Subject to compliance with requirements, provide Schluter-JOLLY, Schluter-QUADEC or comparable product.
6. Transition Strips: As required where adjacent floor finish is of different thickness.

PART 3 - EXECUTION

3.1 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Walls, Metal Studs or Furring:
   1. TCNA W245: Thin-set mortar on coated glass-mat, water-resistant gypsum backer board.
      b. Grout: Polymer-modified.

   09 30 00
SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 Not Used

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acoustical Ceiling Panels: Fire-resistance rated where required; ASTM E 1264.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Armstrong World Industries, Inc.
      b. CertainTeed Corp.
      c. USG Interiors, Inc.
   2. Type and Form for typical installations: ARMSTRONG CIRRUS LAY-IN WHITE 24"X48"X5/8".
   3. LR: Approximately 0.90.
   4. NRC: Approximately 0.70.
   5. CAC: Approximately 35.

B. Metal Suspension Systems: ASTM C 635.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Armstrong World Industries, Inc.
      b. CertainTeed Corp.
      c. Chicago Metallic Corporation.
      d. USG Interiors, Inc.
   2. Wire hangers, braces, and ties.

C. Metal Edge Moldings and Trim: Roll-formed sheet metal.

D. Ceiling Panel Plenum Access, Identification Markings:
   1. Removable ceiling tiles may provide access to mechanical and electrical components located above the ceiling. Where required, mark ceiling panel with colored map tacks glued in place according to the following:
      a. Waste Valves and Unions: Blue.
      b. Waste Cleanouts: Black.
      c. Ventilation Test Areas and Dampers: Purple.
      d. Fire Dampers or Fire Detectors: Red.
      e. Electrical transformers or resistance heaters: Orange.
      f. Natural Gas, Oxygen, and Steam Valves or Unions: Yellow.
      g. Nitrogen, Compress Air, and Vacuum Valves or Unions: Green.

PART 3 - EXECUTION

3.1 INSTALLATION


END OF SECTION 09 51 13
SECTION 09 51 33 - ACOUSTICAL METAL PAN CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:
   1. Metalworks Linear Exterior ceiling panels. 5570 12” Unperforated, Walnut
   2. Wire hangers, fasteners, main runners, cross tees, wall angle moldings and accessories. Universal suspension system

B. Related Sections:
   1. Section 09 51 13 - Acoustical Panel Ceiling
   2. Divisions 23 - HVAC
   3. Division 26 - Electrical Work

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
   10. ASTM E 1264 Classification for Acoustical Ceiling Products.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer’s technical data for each type of ceiling unit and suspension system required.
B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.
C. Shop Drawings: Layout and details of ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.

1.5 QUALITY ASSURANCE

ACOUSTICAL METAL PAN CEILINGS 09 51 33 - 1
A. Single-Source Responsibility: Provide ceiling panel units and grid components by a single manufacturer.

B. Fire Performance Characteristics: Identify ceiling components with appropriate markings of applicable testing and inspecting organization.
   1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
      a. Flame Spread: 25 or less
      b. Smoke Developed: 50 or less

C. Coordination of Work: Coordinate ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store the ceiling panels in a dry, interior location and keep in cartons prior to installation to avoid damage.

B. MetalWorks panels are packaged with the face of the panel toward the outside of the carton. Exercise care in moving and opening cartons to prevent damage to the panel face.

1.7 PROJECT CONDITIONS

A. Space Enclosure:
   1. Building areas to receive ceilings shall be free of construction dust and debris. Products may be installed where temperatures are between 32°F (0°C) and 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Such installations shall not be exposed to abnormal conditions, namely: chemical fumes, presence of standing water, or contact with moisture, as could result from condensations or building leaks. These products cannot be used in exterior applications.

1.8 WARRANTY

A. Ceiling Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to:
   1. Ceiling Panels and Grid System: Rusting and manufacturer’s defects

B. Warranty Period:
   1. Ceiling panels: One (1) year from date of installation.
   2. Grid: Ten (10) years from date of installation.

1.9 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
   1. Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed or a minimum of four (4) full-size units.

PART 2

2.1 MANUFACTURERS

A. Ceiling Panels:
   1. Armstrong World Industries, Inc.

B. Suspension Systems:
   1. Armstrong World Industries, Inc.
2.2. METAL CEILINGS PANELS

A. Ceiling Panels Type E (Metalworks Linear Exterior, Walnut):
   1. Surface Texture: Smooth
   2. Composition: Metal
   3. Color: FXWN2 Effects Walnut
   4. Perforations: Unperforated
   5. Size: 96x12x5/8"
   6. Edge Profile: Square with extended flange.
   7. Fire Performance: ASTM E84; Class A (FM)

B. Accessories
   1. Cap as required.
   2. Suspension System Components for exterior installation.

2.2.1 SUSPENSION SYSTEMS

A. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized steel as per ASTM A 653. Main beams and cross tees are double-web steel construction. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
   3. Color: Match Wood Grain per panel type.

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.

D. Edge Moldings and Trim: Refer to installation information listed in Part 3.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as but not limited to: concrete, terrazzo, plastering and painting has been completed and thoroughly dried out.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.3 INSTALLATION

A. Prior to installation, consult with the local code inspector regarding this “curved” application which varies from the flat ceiling guidelines in ASTM C636. The International Building Code (IBC), as well as its antecedents, permits alternate designs, materials and methods of construction so long as any such alternate is approved by the Authority Having Jurisdiction (AHJ). The AHJ can approve the alternate that has performance equivalent to the prescribed code requirements (see Section 1.5 C). An alternate design, material or construction does meet building code requirements once approved by the AHJ.
B. Seismic Consideration: Installations requiring seismic restraint shall have splayed wire or rigid lateral force bracing applied as prescribed by local building code for flat ceilings.

C. Installation must comply with the requirements of ASTM C636 with the following exceptions:
   1. Suspend main beams 2 feet on center.
   2. Install cross tees every 2 feet along the length of the mains.
   3. Every second row of mains must be held in position by struts, not more than 12 feet apart along length of mains.

D. Install suspension system and panels in compliance with in accordance with the manufacturer’s installation instructions:
   1. MetalWorks Vector Installation, LA295532

E. Suspend main beam from overhead construction with hanger wires spaced 4 feet on center along the length of the main runner. Install hanger wires plumb and straight. The suspension system must be square to within 1/16 inch in 2 feet.

F. Perimeter conditions will require custom treatment. Moldings will need to be bent to match the angle of the ceiling where it contacts the walls at the straight sides, and will need to be cut to align with the panel segments on the faceted sides. It is recommended that these installations tie into a wall or drywall bulkhead rather than to attempt to create a floating ceiling condition. Please refer to the basic perimeter treatment options in the installation instructions below for a baseline.
   1. MetalWorks Vector Installation, LA 295532

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of ceilings panels, including trim, edge moldings, and suspension members. Comply with manufacturer’s instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 33
PART 1 - GENERAL

1.1 SUBMITTALS

A. Review shop drawings for pattern match, if any, for matching during installation and possible waste factors in ordering required amounts. Provide copy of approved shop drawings on job site during installation.

B. Verification Samples: Submit one full size samples illustrating color and pattern for each carpet material specified.

C. Manufacturer’s Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications

1. Upon request, provide a representative to assist in project start-up and to inspect installation while in process and upon completion.
   a. Representative will notify designated contact if any installation instructions are not followed.
   b. Representative will be present at 6 month and 11 month punch walks.

2. 5 year documented experience in manufacturing of carpet tile.

B. Installer Qualifications

1. Flooring contractor must be certified by the carpet manufacturer prior to bid.
2. Flooring contractor to be a specialty contractor normally engaged in this type of work and has prior experience in the installation of carpet tiles.
3. Flooring contractor will be responsible for proper product installation, including floor testing and preparation, as specified by the carpet manufacturer and job conditions herein.

C. Single Source Responsibility: Obtain each type of carpet from one source and by a single manufacturer.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site in manufacturer’s original packaging listing manufacturer’s name, product name, identification number, and related information.

B. Store in a dry location, between 60 degrees F and 80 degrees F and a relative humidity below 65%. Protect from damage and soiling. Stack carpet in boxes.

C. Make stored materials available for inspection by The University’s representative.

D. Store materials in area of installation for minimum period of 48 hours prior to installation.

1.4 PROJECT CONDITIONS

A. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document and Manufacturer’s installation instructions.
B. Comply with 09 00 00 – Finishes, Part 3.1 for preparation of concrete to receive moisture sensitive flooring.

C. Provide all material used in sub-floor preparation and repair as recommended by the carpet manufacturer and chemically and physically compatible with the carpet system being bid.

D. Maintain minimum 65 degrees F ambient temperature and 65% Relative Humidity for 72 hours prior to, during, and 48 hours after installation.

E. Do not install carpet until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

F. Extra Materials: Deliver all unused carpet tiles to The University for “attic stock.”

1.5 WARRANTY

A. Warranty to be sole source responsibility of the Manufacturer. Second source warranties and warranties that involve parties other than the carpet manufacturer are unacceptable.

B. If the product fails to perform as warranted when properly installed and maintained, repair or replace the affected area at the discretion of the Manufacturer.

C. Chair Pads are not required for carpet warranty coverage.

D. Provide warranty for a specifically defined non-prorated period of 15 years to cover the following. “Lifetime” warranties are not acceptable.
   1. Excessive Surface Wear: More than 15% loss of pile fiber weight
   2. Excessive Static Electricity: More than 3.0 kV per AATCC 134
   3. Resiliency Loss of the Backing: More than 10% loss of backing resiliency
   4. Delamination
   5. Edge Ravel
   6. Zippering

E. Provide an additional warranty for a minimum non-prorated period of two years and cover against shrinkage, cupping, and doming.

F. Tuft Bind warranty in lieu of edge ravel and zipper is not acceptable.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. FIBER
   1. Nylon Fiber: Fiber must be premium branded nylon. Mill extruded nylon will not be accepted
   2. Apply durable stain inhibitor to the fiber during product manufacturing to resist fiber staining and soiling. (Minimum average of three fluorine analyses of a single composite sample per CRI TM-102: 500 ppm.)
   4. Dye Method: Fiber to be minimum 95% solution dyed

2.2 BACKING CHARACTERISTICS
   1. Primary Backing: Synthetic Woven or Non-Woven.
   2. Pre-Coat (Fusion Coat): Sealant Vinyl
3. Secondary Backing: Vinyl Hardback. 100% reclaimed-content, nylon reinforced vinyl matrix backing is preferred and should be provided if available.
   a. Density (ASTM D-1667): Minimum 65 lbs/cu ft +/- 5%
   b. Fiberglass Reinforced.
   c. 24” x 24” or 60cm

2.3 PERFORMANCE CHARACTERISTICS

A. Test reports for the following performance assurance testing to be submitted upon request. Submitted results shall represent average results for production goods of the referenced style.

B. Requirements listed below must be met by all products.
   1. Flooring Radiant Panel; ASTM E-648 / NFPA 253: Class 1 (CRF: 0.45 watts/sq cm or greater)
   2. Federal Flammability: CPSC FF 1-70: Passes
   4. Electrostatic Propensity: AATCC 134 (Step & Scuff): 3.0 kV or less
   5. Static Coefficient of Friction: ASTM C-1028: Passes ADA Requirements for Accessible Routes (minimum 0.60)
   7. Lightfastness: AATCC 16E: > 4 @ 100 hours
   8. Vetterman Drum: ASTM D-5417: Minimum 3 @ 22,000 cycles
   9. VOC Chamber Testing
      a. ASTM D-5116: Product inclusive of “dry” adhesive system meets criteria established by the State of Washington Indoor Air Quality Specification for Carpet and/or Carpet & Rug Institute’s (CRI) Indoor Air Quality Carpet Testing Program. If “dry” adhesive (2.02D) not available from manufacturer and “wet” adhesive is used to install the product, carpet and adhesive to meet CRI’s Green Label requirements.
   10. Dimensional Stability: Aachen / ISO 2551: Maximum Change +/- 0.149%

2.4 SUBSTITUTES/ALTERNATES

A. No substitutions or alternates allowed for this project.

2.5 ACCESSORIES

A. Adhesives: Product to be installed using manufacturer’s recommended adhesive. Non adhesive methods are preferred and should be provided if available.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prepare sub-floor to comply with criteria established in Manufacturer’s installation instructions. Use only preparation materials that are acceptable to the Manufacturer.
   1. Remove all deleterious substances from substrate(s) that would interfere with or be harmful to the installation. (i.e. floor wax)
   2. Remove sub-floor ridges and bumps. Fill cracks, joints, holes, and other defects.

B. Verify that sub-floor is smooth and flat within specified tolerances and ready to receive carpet.

C. Verify that substrate surface is dust-free and free of substances that would impair bonding of product to the floor.

D. There will be no exceptions to the provisions stated in the Manufacturer’s installation instructions.
3.2 INSTALLATION, GENERAL

A. Where demountable partitions or other items are indicated for installation on top of finished carpet tile floor, install carpet tile before installation of these items.

B. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

C. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

D. Install borders parallel to walls (where applicable).

E. Trim carpet neatly at walls and around interruptions.

F. Completed carpet is to be smooth and free of bubbles, puckers, and other defects.

3.3 TESTING, CLEANING, AND CERTIFICATION

A. Remove excess adhesive and/or seam sealer from floor and wall surfaces without damage.

B. All rubbish, wrappings, debris, trimmings, etc. to be removed from site and disposed of properly.

C. Clean and vacuum carpet surfaces per manufacturer’s instructions.

D. After each area of carpet is installed, protect from soiling and damage by other trades.

END OF SECTION 09 68 13
SECTION 09 91 23 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements:
   1. Single-Source Responsibility: Provide primers and undercoats produced by and certified compatible with each other and with topcoat.
   2. Quality: Provide manufacturer’s first line commercial products.
   3. Locally Available: Provide products readily available within the Denver metropolitan area in 1- and 5-gallon containers. Readily available means within 24-hours of placing order.
   4. Dry Film Thickness (DFT): Apply all coatings in strict conformance with manufacturer’s recommendations for minimum DFT.

1.2 SUBMITTALS

A. MSDS: Contractor to provide Material Safety Data Sheets (MSDS) for all coatings to the University Project Manager prior to application.

1.3 QUALITY ASSURANCE

A. MPI Standards: Provide products that comply with Master Painter Institute (MPI) standards indicated and that are listed in its "MPI Approved Products List.”

B. All painting must be of journeyman level craftsmanship, paying special attention to preparation, etching, priming and undercoating.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Sherwin-Williams Company (The).
   2. Benjamin Moore & Co.
   3. PPG Architectural Finishes, Inc.

2.2 BLOCK FILLERS

A. Block Filler, Acrylic/Latex, Interior/Exterior for Concrete Masonry Unit Substrates: MPI #4

2.3 PRIMERS/SEALERS

A. Primer, Alkali Resistant, Water Based, for Concrete Substrates: MPI #3

B. Primer Sealer, Interior, Institutional Low Odor/No VOC, for Gypsum Board and Plaster Substrates: MPI #149

C. Primer, Latex, for Interior Wood Substrates: MPI #39

D. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.
2.4 METAL PRIMERS
   A. Primer, Rust-Inhibitive, Water Based, for Ferrous-Metal Substrates: MPI #107
   B. Primer, Galvanized, Water Based, for Zinc-Coated Metal Substrates: MPI #134
   C. Primer, Quick Dry, for Aluminum Substrates: MPI #95

2.5 WATER-BASED PAINTS
   A. Latex, Interior, Gloss (Gloss Level 6, except minimum gloss of 65 units at 60 degrees): MPI #114.
   B. Latex, Interior, Institutional Low Odor/No VOC, Flat (Gloss Level 1): MPI #143.
   C. Latex, Interior, Institutional Low Odor/No VOC, Egg-Shell (Gloss Level 2) MPI #144 or (Gloss Level 3) MPI #145.
   D. Latex, Interior, Institutional Low Odor/No VOC, Semi-Gloss (Gloss Level 5): MPI #147.

2.6 DRY FOG/FALL COATINGS
   A. Dry Fall, Latex, Flat: MPI #118.
   B. Dry Fall, Water Based, for Galvanized Steel, Flat (Gloss Level 1): MPI #133.

PART 3 - EXECUTION

3.1 INTERIOR PAINTING SCHEDULE
   A. Concrete Substrates, Nontraffic Surfaces: The following system is acceptable, high performance coating specified in SECTION 09 96 00 preferred.
      1. Institutional Low-Odor/No VOC Latex System: MPI INT 3.1M
         a. Prime Coat: Primer sealer, interior, institutional low odor/No VOC, MPI #149.
         c. Topcoat: Latex, interior, institutional low odor/No VOC, semi-gloss (Gloss Level 5), MPI #147.
   
   B. Concrete Substrates, Traffic Surfaces: At all concrete traffic surfaces scheduled to receive sealer.
      1. Water-Based Clear Sealer System: MPI INT 3.2G
         a. First Coat: Sealer, water based, for concrete floors, MPI #99.
         b. Topcoat: Sealer, water based, for concrete floors, MPI #99.

   C. CMU Substrates: The following system is acceptable, high performance coating specified in SECTION 09 96 00 preferred.
      1. Institutional Low-Odor/No VOC Latex System: MPI INT 4.2E
         c. Topcoat: Latex, interior, institutional low odor/No VOC, semi-gloss (Gloss Level 5), MPI #147.

   D. Steel Substrates: At all steel substrates not indicated to receive high-performance coatings specified in SECTION 09 96 00.
      1. Water-Based Dry-Fall System (for overhead work only): MPI INT 5.1C
         a. Prime Coat: Shop primer to be specified in Division 05.
         b. Topcoat: Dry fall, latex, flat, MPI #118.
2. Institutional Low-Odor/No VOC Latex System: MPI INT 5.1S
   c. Topcoat: Latex, interior, institutional low odor/No VOC, semi-gloss (Gloss Level 5), MPI #147.

E. Galvanized-Metal Substrates: At all galvanized metal substrates not indicated to receive high-performance coatings specified in SECTION 09 96 00.
   1. Water-Based Dry-Fall System (for overhead work only): MPI INT 5.3H
      a. Prime Coat: Dry fall, water based, for galvanized steel, flat (Gloss Level 1), MPI #133.
      b. Topcoat: Dry fall, water based, for galvanized steel, flat (Gloss Level 1), MPI #133.
   2. Institutional Low-Odor/No VOC Latex System: MPI INT 5.3N
      a. Prime Coat: Primer, galvanized, water based, MPI #134.
      c. Topcoat: Latex, interior, institutional low odor/No VOC, semi-gloss (Gloss Level 5), MPI #147.

F. Aluminum (Not Anodized or Otherwise Coated) Substrates:
   1. Institutional Low-Odor/No VOC Latex System: MPI INT 5.4G
      a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
      c. Topcoat: Latex, interior, institutional low odor/No VOC, semi-gloss (Gloss Level 5), MPI #147.

G. Wood Substrates:
   1. Institutional Low-Odor/No VOC Latex System: MPI INT 6.1Q, MPI INT 6.2L, MPI INT 6.3V, and MPI INT 6.4T
      a. Prime Coat: Primer, latex, for interior wood, MPI #39.
      c. Topcoat: Latex, interior, institutional low odor/No VOC, semi-gloss (Gloss Level 5), MPI #147.

H. Gypsum Board and Plaster Substrates:
   1. Latex System: MPI INT 9.2A. At gypsum board, GFRG, and plaster substrates scheduled to receive gloss paint.
      a. Prime Coat: Primer sealer, latex, interior, MPI #50.
      c. Topcoat: Latex, interior; gloss, (Gloss Level 6, except minimum gloss of 65 units at 60 degrees), MPI #114.
   2. Institutional Low-Odor/No VOC Latex System: MPI INT 9.2M. At all gypsum board, GFRG, and plaster substrates, unless indicated otherwise.
      a. Prime Coat: Primer sealer, interior, institutional low odor/No VOC, MPI #149.
      c. Topcoat: Latex, interior, institutional low odor/No VOC; Provide one of the following as indicated in Finish Schedule:
         1) Flat (Gloss Level 1), MPI #143
         2) Egg-shell (Gloss Level 2), MPI #144 or (Gloss Level 3), MPI #145
         3) Semi-gloss (Gloss Level 5), MPI #147
      d. Typical Sheen: Egg-shell (Gloss Level 2 or 3) unless indicated otherwise.

END OF SECTION 09 91 23
SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Fire Extinguishers: Provide in accordance with NFPA 10.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS:

A. Multipurpose dry-chemical type, manufacturer's standard container: 4-A:60-B:C, 10-lb.

B. Other types: Not permitted, except if approved by the University Fire and Life Safety Officer, through the University Project Manager.

2.2 FIRE PROTECTION CABINET:

A. Type and Size: For indicated fire extinguisher.

B. Door Type: Solid with vertical window.

C. Door Glazing: Acrylic sheet, glass not permitted.

D. Accessories: Door locks not permitted unless approved by the University Fire and Life Safety Officer, through the University Project Manager.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mounting:

1. Locations: As approved by the University Fire and Life Safety Officer through the University Project Manager.

2. Mounting Height: 48” to center of door handle from finished floor.

3. Accessibility: Comply with accessibility requirements for both approach and reach.

END OF SECTION 10 44 00
SECTION 21 05 00 - FIRE SUPPRESSION

PART 1 - GENERAL

1.1 REFERENCES

A. Section 230000 - General Mechanical Provisions

B. Section 230553 - Identification for Piping and Equipment

1.2 DESIGN REQUIREMENTS

A. Automatic Fire Sprinklers:
   1. Zone system according to location. Annunciate each zone at the building fire annunciator in accordance with NFPA regulations. Provide separate zones for each flow switch and each tamper switches.
   2. Install recessed sprinklers in 8-foot ceilings. Provide wire guards on sprinklers, which protrude beyond the ceiling and are lower than 8 feet. Wire guards may be painted.
   3. The type of sprinkler to be installed must be specified and approved no later than final design completion.
   4. Consult the University CBO, through the University Project Manager, for fire protection and life safety concerns.
   5. Supply all connections to the fire system from the domestic water system through a reduced pressure backflow prevention device.
   6. Provide fire sprinkler systems for every building. Provide sprinklers throughout the building. Discuss areas without sprinklers with the University Project Manager.

B. System Design:
   1. General:
      a. Base design on requirements of NFPA 13, including Appendices.
      b. Verify fire hydrant flow test according to NFPA 13 and NFPA 291. Use hydrant flow results for system design calculations.
      c. Base design of sprinkler system on hydraulic calculations for group and occupancy listed in NFPA 13. Include outside hose flows upon the same hazard as the building. No allowance will be made for inside hose station flows. Include a safety factor of 10 psi in hydraulic calculations.
      d. Room design method is not acceptable.
      e. Size flow velocity in underground water mains not to exceed 16 feet per second. Size velocity in above ground sprinkler systems not to exceed 20 feet per second.
      f. Protect all areas of each facility with an automatic sprinkler system unless specifically waved by the University Project Manager.
      g. Provide a separate zone on each floor for buildings exceeding 3 floor levels including the basement.
   2. Wet Pipe Systems:
      a. Use wet pipe systems for the majority of system applications.
      b. Use electronic vane type water flow detectors except for the following:
         1) Alarm check valve assemblies may be used for systems installed in buildings if there is no approved fire alarm control panel installed and the system protects only one zone.
   3. Protection for Mechanical Shafts:
      a. Consult the University Project Manager in all situations.
      b. Refer to the appropriate NFPA standards for the design of sprinkler systems for special hazard exhaust systems such as paint spray operations or cooking exhaust.
1.3 SUBMITTALS

A. Submittals for the following shall be made in accordance with Section 230000.
   1. Submit sample of each type and finish of sprinkler and escutcheon plate to be installed.
   2. Submit shop drawings showing all details as defined by NFPA 13. Show pipe routing and coordination of all building components.
   3. Submit copies of Contractor’s Material and Test Certificates similar to those in NFPA 13.

1.4 QUALITY ASSURANCE

A. Design shall be performed by a NICET Level III or IV Technician, Registered Fire Protection Engineer, or Registered Professional Engineer with experience in fire protection design and registered for the design and installation for fire protection systems in the State of Colorado.

B. Installer shall have a minimum of five years of experience in the design and installation of automatic fire sprinkler systems and employ workmen experienced and skilled in this trade.

C. Installer shall have the capability of providing a full service maintenance, testing, and inspection program in accordance with NFPA standards and where applicable, be certified to perform these services.

D. Installer shall have an emergency service capability for response to emergency conditions and shall be capable of responding within four hours or receiving notification with 24 hour service capability.

E. Regulatory Requirements: Comply with the following codes:
   1. NFPA 13 - Standard for the installation of sprinkler System.
   2. NFPA 24 - Installation of Private Fire Service Mains and their applications.
   4. UL Compliance: Fire protection system materials and components shall be Underwriter’s Laboratories listed and labeled for the application anticipated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Sprinklers:
      a. Reliable
      b. Viking Corp.
      c. Grinnel

2.2 MATERIALS, GENERAL

A. Piping:
   1. Black steel pipe for wet pipe systems and standpipes. Hot dipped galvanized pipe for dry pipe, pre-action and deluge systems.
   2. Schedule 40 for pipe 2-inch and smaller and joined with threaded or cut grooved fittings.
   3. Schedule 10 for pipe sizes up to 5 inch and 0.134 inches for 6 inch pipe for pipe joined by welding or roll grooved fittings.
   4. Other pipe thickness is acceptable provided the pipe UL corrosion resistance ratio (CRR) exceeds 1.00. Schedule 40 black steel has a CRR of 1.0
   5. Fittings: Provide hot dipped galvanized fittings for dry pipe, pre-action, and deluge systems. Threaded fittings are preferred in architecturally exposed or sensitive areas.
   6. Do not use Copper pipe or fittings
B. General: Equipment shall bear the UL listing for the intended use.

C. Sprinklers:
   1. Nominal 1/2 inch orifice for “ordinary temperature classification except where higher temperature heads are required or shown.
   2. Use quick response sprinklers where allowed by NFPA 13 and suitable for the specific project.
   5. Non-finished areas: Brass finish, ordinary temperature rating.
   7. Localized areas with potential for freezing: Dry pendant or dry pendant sidewall sprinklers.
   8. Metal Cabinet and Spare Sprinklers: Refer to Section 01 78 46 – Extra Stock Materials.
   9. Guards: Provide on sprinklers subject to damage or located within 7 feet of the floor, or as otherwise indicated for special conditions.
  10. Spare Parts: Refer to Section 01 78 46 – Extra Stock Materials.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Where mounting heights are not detailed or dimensioned, install overhead fire protection services and equipment to provide maximum headroom possible. Install a minimum 1-1/4 inch threaded capped connection on the end of each cross main to facilitate flushing.

B. Identification:
   1. Valves: identify and label all sprinkler valves. Attach caution signs to all valves controlling water to sprinkler systems in accordance with NFPA 13.
   2. Miscellaneous Fire Lines: Label inspector’s test drain lines, main drain, and fire lines.
   3. Nameplate: Mount hydraulic designed information nameplate at alarm valve and include information in accordance with NFPA 13.

3.2 TESTING, CLEANING, AND CERTIFICATION

A. Record inspections and testing on a copy of Material and Test Certificates as shown in NFPA 13.

B. Prior to any test on sprinkler/standpipe systems, flush piping to remove any foreign matter.

C. Hydrostatically test all systems, including fire department connection, to not less than 200 psi for 2 hours. Read test pressure from gauge located at low point of system.

D. Correct leaks immediately. On threaded pipe, tighten joints. If necessary, dismantle and replace section. Caulking, preening, or stop-leak compounds are not permitted.

E. Function Trip Test:
   1. Wet Pipe System: Functionally trip test system components and alarms by opening the inspector’s test connection.

3.3 COMMISSIONING (DEMONSTRATION)

A. Provide 4 hours of instruction to the University Facilities Operations personnel. Include valve and drain locations, pipe routing, maintenance and testing procedures.

END OF SECTION 21 05 00
SECTION 23 00 00 – PLUMBING, HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

PART 1 - GENERAL

1.1 REFERENCES

A. Manual Part 3, Project Planning and Design Guidelines and Standards

B. Drawing and General Provisions of Contract, including General and Supplementary General Conditions and Division 1 section apply to work in Division 23.


1.2 SUBMITTALS

A. Submittals shall be made in accordance with Section 01300 and as required by various Section of Divisions 21, 22, and 23 with the following provisions:
   1. Submittals will be reviewed by the Engineer to determine that the materials, equipment, and installation methods are in accordance with the project design concepts. The Contractor shall be responsible for space requirements, configurations, performance, bases, supports, structural members and openings in structure, and other apparatus that may be affected by the material, equipment, or installation.
   2. Include current, published catalog and specification sheets pertaining to proposed material and equipment.
   3. Identify each item with identification symbols identical to those used on the drawings and/or in the specifications.

B. Record Documents: Furnish record documents for equipment and systems under Divisions 21, 22, and 23 of the Standards in accordance with Section 01720 and the following:
   1. Mark drawing prints to indicate revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, dampers, and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located. Note changes of ductwork or piping on the drawings if it has been relocated more than 1 foot from where shown on the drawings.
   2. List all equipment parameters on the drawings in schedules whenever possible. Include room number where equipment is located.
   3. At the completion of the project, mark all valve tag numbers on the drawings and turn these drawings over to the University Project Manager.

1.3 QUALITY ASSURANCE

A. Installer Qualification:
   1. Workmanship shall conform to the highest industry standard for each specific type of work.
   2. Perform work in accordance with standard commercial practices.

B. Comply with Part 3 of this manual, state and federal codes, rules and regulations. As a minimum requirement, codes, rules and regulations take precedence over the drawings and specifications. Where the requirements of the drawings and specifications exceed those of applicable codes, rules and regulations, the drawings and specifications shall govern.
C. Chemical and physical properties, design, and performance characteristics of all material and equipment, and methods of construction shall be in accordance with the following applicable codes, regulations and standards. Current editions in effect 30 days prior to receipt of bids will apply.

1. Air Conditioning and Refrigeration Institute (ARI)
2. Air Movement and Control Association, Inc. (AMCA)
3. American Gas Association (AGA)
4. American National Standards Institute (ANSI)
5. (ASHRAE) American Society of Heating, Refrigerating and Air Conditioning Engineers
6. American Society of Mechanical Engineers (ASME)
7. American Standard Code for Pressure Piping (ASCPP)
9. American Water Works Association (AWWA)
10. Compressed Gas Association (CGA)
11. Environmental Protection Agency (EPA)

1.4 DELIVERY, STORAGE AND HANDLING

A. All mechanical equipment and materials shall be delivered, stored and handled in accordance with manufacturers instructions and the requirements of Section01 10 00.

1.5 WARRANTY

A. All mechanical equipment, materials and workmanship warranties shall be provided in accordance with the requirements of Section 01740 and the following:

1. Warranty all equipment, materials, workmanship, and proper operation of equipment and apparatus for a period of one year from date of final acceptance unless indicated otherwise in the individual sections. Extended warranty periods are identified in individual sections.
2. Compile and assemble the warranties specified in the individual sections into the operating and maintenance manuals.
3. Provide complete warranty information for each item to include date or beginning of warranty or bond; duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. As specified in individual sections.

2.2 MATERIALS, GENERAL

A. Products:
1. Provide material and equipment new and free from defects.
2. Install all material and equipment in accordance with the manufacturer's current published recommendations.
3. Certain materials and equipment are specified by manufacturer and model or catalog number. Such specified items are the basis of design and establish a degree of quality, performance, and physical configuration.
4. Equipment and materials manufactured by any one of the manufacturers listed on the drawings or in the specifications will be acceptable.
5. Where no manufacturer is listed, provide a standard product meeting the requirements of the drawings and specifications, and manufactured by a firm regularly engaged in the manufacture of such products. All equipment, when possible, shall be:
   a. Manufactured and purchased in Colorado
   b. Manufactured and purchased in the USA.
6. Requests prior to bid for approval of equipment or material not specified shall be done in accordance with the requirements of Section 01 25 00.

PART 3 - EXECUTION

A. Additional charges will not be authorized due to the contractor's failure to become familiar with the existing conditions.

3.2 INSTALLATION, GENERAL

A. Permits and Inspections:
   1. Secure all required permits, the university will pay for permit and inspection costs.
   2. Pay all applicable royalties, inspection fees, taxes, and licenses.

B. Responsibility of Contractor:
   1. The contractor is responsible for the complete installation and satisfactory operation of all work in accordance with requirements of the drawings and specifications.
   2. The component parts of the installation shall function together as workable systems. Each system shall be left with all parts adjusted and in proper working order.

C. Coordination:
   1. Coordinate project in accordance with Section 01040.

D. Scaffolding, Rigging, and Hoisting:
   1. Provide all scaffolding, rigging, and hoisting necessary to safely accomplish the work following OSHA requirements.
      a. Remove from premises when no longer needed.
   2. Provide necessary services to deliver, erect, place, and install all equipment and apparatus furnished.

E. Damaged Surfaces:
   1. At completion of the work, all mechanical material and equipment furnished shall be inspected for damage.
      a. Repair damaged factory finishes to match adjacent, undamaged areas.
      b. Replace deformed metal cabinets, jackets, and enclosures with new items. Finish shall match similar undamaged items.

3.3 TESTING, CLEANING AND CERTIFICATION

A. Cleanup:
   1. At completion of the work, check and thoroughly clean all equipment.
      a. Clean coils and plenums.
      b. Clean under, in, and around equipment.
      1) Clean exposed surfaces of piping, ducts, and hangers.
      2) Clean equipment cabinets and enclosures.
      3) Provide and install new filters for equipment.
      4)

B. Project Closeout:
   1. Verify that all work has been completed prior to requesting final walkthrough, including Contractor’s preliminary review of mechanical systems start-up and acceptance checklists.

3.4 COMMISSIONING (DEMONSTRATION)
A. Training and Demonstration: Schedule instructional meetings for the university’s Facilities Operations maintenance personnel on the proper operation and maintenance of mechanical systems. Provide the project manager a minimum of 5 days notice prior to any training, demonstration, or testing.

END OF SECTION 23 00 00
SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SYSTEM PERFORMANCE REQUIREMENTS

A. Require general, mechanical and electrical contractors to coordinate and cooperate with the TAB contractors as necessary to allow them to perform work.

B. Items such as start-up, initial testing, cleaning, calibration of controls, electrical testing, etc., are to be completed prior to the commencement of TAB work.

C. Submit name of balancing and testing agency with resume of the agency, including qualifications of personnel to be used and authority and responsibilities of personnel.

D. Product data shall be submitted, in accordance with Section 23 00 00, for each of the following:
   1. Procedure Submittal: Prior to commencing work, submit, for approval, a written procedure of how balance will be performed and a description and manufacturer’s name of equipment and instruments to be used. The submittal shall include, but not necessarily be limited to the following:
      a. List of preliminary checks to be performed at the job site such as confirmation that manual volume dampers are present, filters are installed, frequency drive units operational, location of control sensors, etc.
      b. Identify how the air outlets will be measured and the type of instruments to be used.
      c. Modes of operation that the system will be placed in during balancing and testing, i.e., full cooling and heating, maximum and minimum outside air flows, maximum and minimum sash positions for fume hoods, toilet fans on or off, etc.
      d. Initial test procedures for preliminary balance.
      e. Final test procedures.
      f. List of deficiencies in mechanical system that could hinder the balance work such as missing or leaky dampers, incomplete systems, inadequate fans, etc.
      g. Sample of data sheets and test forms to be used in final report.
      h. Identification and manufacturer’s name of equipment to be used on project and proof of last calibration on each piece.
   2. Progress Report(s) – Report, in writing, any deficiencies or problems with air or water systems that have affected balance work. Include items that affect system performance such as broken thermostats, damaged ductwork, excessive noise, etc.

1.2 QUALITY ASSURANCE


B. TAB contractors shall present to the University Project Manager and general contractor, proof of current equipment certification approved by National Institute of Standards and Technology.

C. Testing Agency Qualifications: Agency shall be NEBB or AABC certified in testing and balancing disciplines required for this project. Work shall be performed under direct supervision of professional engineer, NEBB, or AABC certified supervisor.

D. Guarantee of Work: TAB contractor shall guarantee the balancing for a period of 90 days from date of acceptance of final report. During this period, the TAB contractor shall make personnel available at no
cost to the university to verify measurements and/or correct deficiencies in the balance. During this period, emergency adjustments shall not void this warranty.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Pre-Balancing Conference: Before beginning testing, adjusting, and balancing procedures, schedule and conduct a conference with University Project Manager, Facilities Operations Representative(s) and representatives of installers of mechanical and control systems. Conference objective is final coordination and verification of system operation and readiness for testing, adjusting, and balancing, and assigning testing responsibilities of each installer.

B. Put all heating, ventilating, and air conditioning systems and equipment into full operation and continue operation during testing and balancing.

C. Balancing:
   1. Air Balance:
      a. Balance air inlets and outlets to produce air quantities within 10 percent of indicated value.
      2. After deficiencies are corrected, retest the systems until acceptable values are obtained.

D. Report:
   1. Report Format: Standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Include information indicated on standard report forms prepared by AABC or NEBB for each respective item and system, and schematic diagrams for each system or piece of equipment to accompany each respective report form. Bind report forms complete with schematic systems diagrams and other data in reinforced vinyl three-ring binders. Provide binding edge labels with project identification and a title descriptive of contents. Divide contents of binder into following divisions, separated by divider tabs:
      a. General Information and Summary
      b. Air Systems
      c. Recommendations.
   2. Report Contents: Provide following minimum information, forms, and data:
      a. General Information and Summary:
         1) Inside cover sheet to identify testing, adjusting, and balancing agency, contractor, and project name. Include contact names, addresses, and telephone numbers.
         2) Certification sheet containing seal, address, telephone number, and signature of Certified Test and Balance Engineer.
         3) Listing of instrumentation used for procedures along with proof of calibration.
      b. Test Data: Report shall include the following data, in addition to certified field report readings taken during the balancing and testing operations. Include required or specified reading, first reading taken, and final balanced reading.
         1) Air Balance for Supply, Return, Relief, and Exhaust Systems:
            a) Outlets, Inlets, Diffusers, Registers, and Grilles: Size, reading orifice size, velocity in fpm, and design and final balanced air quantity in cfm.
            2) Include sheet that reports method of balance, project altitude, and any correction factors used in calculations.
            3) Include a reduced set of contract drawings with all terminals (outlets, inlets) clearly marked and all equipment designated.
            4) Prepare list of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

3.2 TESTING, CLEANING AND CERTIFICATION
A. Provide four (4) copies of testing, adjusting, and balancing report bearing seal and signature of the TAB Engineer. The report shall be certification that systems have been tested, adjusted, and balanced in accordance with referenced standards; accurate representation of how systems have been installed; and accurate record of all final quantities measured.

B. Final Report:
   1. Submit a preliminary report within 30 days of completed TAB work. Report shall include the following information.
      a. A general discussion preface section. This section shall summarize all abnormalities or problems encountered during the project and what course of action was taken. This summary should be assembled from the written progress reports described earlier, except that it will be expanded to include responses from the Engineer, the University Project Manager and Contractor regarding each problem indicated in the progress reports.
      b. Copies of correspondence if related to the performance and balance of the systems.
      c. Status of doors, windows and equipment static pressures during balance work.
      d. Reduced 11" x 17", readable, as-built drawings obtained from the University Project Manager. All devices and equipment shall be clearly labeled.
   2. Any corrective action shall be completed and the systems re-tested. The corrected system information shall be provided in the final report.
   3. Final Report shall be completed within 30 days of preliminary report.

3.3 DEMONSTRATION

A. Upon request of the university Facilities Operations Representative, through the University Project Manager, the balancing firm shall demonstrate measured quantities of randomly selected equipment. The number of readings verified will not exceed 10 percent of the total in the report.

END OF SECTION 23 05 93
SECTION 23 07 00 – INSULATION

PART 1 - GENERAL

1.1 SYSTEM DESIGN REQUIREMENTS
A. Provide minimum insulation thickness as suggested in ASHRAE Standard 90A.

1.2 DEFINITIONS
A. Concealed: As used in this Section refers to insulation in ceiling plenums, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, unexcavated areas, and crawl spaces.
B. Exposed: As used in this Section refers to insulation that is not concealed.

1.3 QUALITY ASSURANCE
A. Composite insulation, including jackets, coverings, sealers, mastics, and wet or dry adhesives shall have a flame spread rating of 25 or less and smoke-developed rating of 50 or less, as tested by ASTM E84.
B. Elastomeric foam with a smoke-developed rating of 150 or less may be used, except in ducts, plenums, and concealed spaces that are part of the air distribution system.
C. PVC fitting covers shall have a maximum flame spread of 25 or less and are exempted from the smoke spread criteria.
D. Duct liner shall comply with NAIMA Fibrous Glass Duct Liner Standard.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Insulation: Identification and/or type of material from a manufacturer is as shown under each heading of 2.2 Materials, General.
      a. Manville Products
      b. CertainTeed
      c. Rubatex
      d. Knauf
      e. Pittsburgh Corning
   2. Adhesives, Coatings, and Sealants:
      a. Foster
      b. Childers Product Company
      c. Hardcast

2.2 MATERIALS, GENERAL
A. Pipe Insulation:
   1. Glass Fiber:
      a. Manville Micro Lok AP T Plus
      b. Asbestos-free, color-coded throughout material. Coding shall remain stable throughout rated temperature range.
   2. Cellular Glass:
a. Waterproof, closed cell, rigid insulating material composed of sealed glass cells conforming to ASTM C552.
b. Thermal Conductivity (k value): 0.35 at 75 degrees F.
c. Density: 8 pounds per cubic foot.
d. Water-vapor Permeability: 0.005 perm-inch.
e. Pittsburgh Corning Foamglas.

B. Duct Insulation:
1. Flexible Fiberglass Blanket:
   a. ASTM C553, Type 1, Class B-3.
   b. Thermal Conductivity (k value): 0.25 at 75 degrees F.
   c. Density: 1.0 pounds per cubic foot.
   d. Vapor barrier jacket: Aluminum foil reinforced with fiber-glass yarn and laminated to fire-resistant Kraft (Foil Scrim Kraft).
   e. Manville Microlite.

2. Rigid Fiberglass Board: Not allowed.

C. Duct Liner (allowed for sound attenuation only, 6 lineal feet, at leaving side of terminal units. Duct liner is not allowed in lab air supply):
1. Round Duct Liner:
   a. Rigid material, conforming to ASTM C427.
   b. Thermal Conductivity (k value): 0.23 at 75 degrees F.
   c. Noise Reduction Coefficient: ASTM C423, minimum of 0.70 based on type-A mounting.
   d. Velocity rating: Minimum of 4,000 feet per minute.
   e. Manville Spiracoustic.
   f. Manville Thermo-12/Gold.

D. Tank Insulation:
1. Flexible Fiberglass Board:
   a. Thermal Conductivity (k value): 0.35 at 200 degrees F.
   b. Maximum Service Temperature: 650 degrees F.
   c. Manville Pipe and Tank Insulation.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL:

A. Overview:
1. Install insulation only after piping, ducts, and equipment have been tested and approved by the Project Manager, and after all other tests and certifications which are required by the specifications have been satisfactorily completed.
2. Continue insulation vapor barriers through penetrations except where prohibited by code.
3. Install pipe and duct insulation continuous through wall and floor openings except where the penetrated surfaces or assemblies are fire-resistance rated. Provide fire-stop insulation at penetrations of fire-rated surfaces and assemblies. Maintain fire-resistance ratings of penetrated surfaces and assemblies.
4. Install insulation on cold surfaces with a continuous, unbroken vapor seal. Insulate and vapor seal supports and anchors, which are directly secured to cold surfaces.
5. Seal all exposed raw edges of insulation with vapor retarder or finishing cement.
6. Do not use staples on vapor barrier jackets. Where staples must be used, thoroughly seal the vapor barrier penetrations with a white vapor-barrier finish. The Engineer prior to installation must approve use of staples.
7. Do not weld insulation support pins to pressure vessels.
8. Leave all insulation surfaces dry and clean, and ready for subsequent work.

END OF SECTION 23 07 00
SECTION 23 20 00 - PIPING

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Soldering and brazing procedures shall conform to ANSI B9.1 Standard Safety Code for Mechanical Refrigeration.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Manufacturer’s Qualifications: Firms regularly engaged in manufacture of pipes and pipe fittings of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years
   2. Grooved Piping:
      a. ITT Grinnell Corp.
      b. Victaulic Co. of America
   3. Piping Connectors
      a. Fernco, Inc.
   4. Pipe Thread Sealant
      a. The Rectorseal Corp.
   5. Drainage Piping Specialties, including backwater valves, expansion joints, drains, cleanouts, flashing flange and vent flashing sleeve.
      a. JR Smith
      b. Zurn Industries
      c. Wade
      d. Josam

B. Copper Tube and Fittings:
   1. Copper Tube: ASTM B 88; Type K or L as indicated for each service; hard-drawn, except as otherwise indicated.
   2. DWV Copper Tube: ASTM B306
   3. ACR Copper Tube: ASTM B280.
   6. Cast-Copper Solder-Join Drainage Fittings: ANSI B16.23 (drainage and vent with DWV or tube).
   8. Cast-Copper Flared Tube Fittings: ANSI B16.26
   9. Bronze Pipe Flanges/Fittings: ANSI B16.24 (Class 150 and 300)
   10. Copper-Tube Unions: Provide standard products recommended by manufacturer for use in service indicated.

C. Cast-Iron Soil Pipes and Pipe Fittings:
   5. Neoprene Compression Gaskets: ASTM C564

D. Miscellaneous Piping Materials/Products:
2. Soldering Materials: Lead-free solder
3. Brazing Materials: Except as otherwise indicated, provide brazing materials to comply with installation requirements.
   a. Comply with AWS A5.8, Section II, ASME Boiler and Pressure Vessel Code for brazing filler metal materials.
      1) Copper phosphorus – Bcup
      2) Silver - BAg minimum 4% Silver content
4. Gaskets for Flanged Joints: ANSI B16.21; full-faced for cast-iron flanges; raised-face for steel flanges, unless otherwise indicated.
5. Pipe Thread Sealant Material: Except as otherwise indicated, provide all pipe threads with the sealant material as recommended by the manufacturer for the service.

E. Piping Systems:
1. Heating Water, Domestic Hot and Cold Water:
   a. Above Grade, Inside Buildings: Type L, hard drawn copper tube with wrought copper or bronze fittings, lead free solder joints or Schedule 40, galvanized steel pipe A53 grade B, ERW w/galvanized Grooved end fittings.
   b. Below Grade, Inside and Outside Buildings: Underground outside fittings shall comply with City of Aurora standards.
      1) 2 inches and Smaller: Type K, soft copper or Type K annealed copper tube with wrought copper fittings, silver brazed solder joints.
      2) 2.5 inches and Larger: Class 250, tar coated outside, cement lined, cast iron or ductile iron with mechanical or push on joints.
2. Equipment drain and overflows: Type “M” or “DWV” copper.
3. Sanitary Sewer and Vents:
   a. Above Grade: Service weight cast iron, no-hub type with neoprene gaskets; service weight cast iron, hub and spigot type with neoprene gaskets; or DWV copper with wrought copper or cast brass fittings.
      1) Use heavy duty no hub couplings 4” wide 304 stainless steel shield, with six (6) stainless steel clamps mounted in series on the following:
         a) Sanitary vent piping 4” and larger.
         b) Sanitary piping 3” and larger.
         c) All storm piping.
      2) Torque to minimum 80 inch pounds or per manufacturer's recommendation.
   b. Cleanout Openings: Two-way type, 1-1/4 inch nominal size minimum and located such that long lines can be entered from both ends. Lubricate plugs at installation.
   c. All sump pumps receiving floor drains located in boiler rooms will be non-submersible type. Pumps will be designed to handle hot water because boilers are flushed or emptied at intervals into floor sumps.
   d. Sizes smaller than ½” - sealed type.
   e. Minimum burst pressure - 1500 psig.
4. Expansion Valve:
5. Thermostatic type, diaphragm or bellows operated.
6. External superheat adjustment factory set for 10°F superheat (adjustable).
7. Compatible with refrigerant type for the project.
8. Pressure rated per project requirements.
9. Power elements and valve size shall be as recommended by the manufacturer, for the service intended.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL
A. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16-inch misalignment tolerance.
   1. Comply with ANSI B31 Code for Pressure Piping.
   2. Electrical Equipment Spaces: Do not run piping through transformer vaults and other electrical or electronic equipment spaces and enclosures. Only piping serving this type of equipment shall be allowed.
   3. Use fittings for all changes in direction and all branch connections.
   4. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
   5. Locate groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
   6. Install drainage piping with a minimum 1/8 inch per foot downward slope in the direction of the drain and a maximum slope of ¼ inch per foot.
   7. Install drains at all low points in mains, risers, and branch lines consisting of a tee fitting, ¾-inch ball valve, and short ¼-inch threaded nipple, hose connection, and cap.

B. Hangers and Supports:
   1. Maintain uniform grading and pipe slope of piping system. Install supports between piping and building structure to prevent swaying and vibration. Install hangers to provide a minimum 1/2-inch clear space between finished covering and adjacent work. Use threaded rods with two lock nuts.
   2. Do not support weight of piping from mechanical equipment, ductwork, pump flanges, coil connections, and related items.
   3. Support hanger rods by coach screw rods, angle iron clips, or beam clamps. No drilling of structural members will be permitted without approval. Hanger rods shall be attached to the top of joist beams.
   4. Do not bend hanger rods to provide alignment of piping offset from overhead supports.
   5. Provide sway bracing every 40 feet on cast iron.
   7. Vertical Supports
      a. Cast Iron Pipe: Support at each floor, not to exceed 15 feet between supports, and at pipe base.
      b. Screwed Pipe: Support at 8 foot on center for 1-1/2 inch and smaller pipe. Support at 10 foot on center for 2-inch and larger pipe.
      c. Copper Pipe: Support at 6 foot on center for 1-1/2 inch and smaller pipe. Support 8 foot on center for 2-inch and larger pipe.
   8. Trapeze Hangers: Space for smallest pipe in-group. Provide additional hanger rod at mid span where trapeze length exceeds 4 feet. Secure pipe at each trapeze with standard pipe strap. Rest uninsulated copper pipe on neoprene sleeves.

C. Pipe Joint Construction:
   1. Soldered Joints: Comply with the procedures contained in the AWS “Soldering Manual”.
   2. Brazed Joints: Comply with the procedures contained in the AWS “Brazing Manual”.
      CAUTION: Remove stems, seats, and packing of valves and accessible internal parts at piping specialties before brazing.

3.2 TESTING, CLEANING, AND CERTIFICATION

A. Test all piping systems in accordance with tests outlined in individual sections. Provide temporary equipment for testing, including pump and gages. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Test all new piping and parts of existing piping that have been altered extended or repaired. Submit report(s) on the results of each test.
B. Give a minimum of twenty-four hours notice to the Engineer for dates when acceptance test will be conducted. Conduct tests as specified for each system in presence of the University Project Manager or representative of agency having jurisdiction. Submit three (3) copies of successful tests to the Engineer for his review. Report shall state system tested and date of successful test.

C. Remove equipment not able to withstand test procedure during test.

D. For piping, which is to be concealed, piping shall remain uncovered until tests have been completed.

E. Drain test water from piping systems after testing and repair work has been completed.

F. Potable Water Piping System:
   1. Cap domestic water piping and subject piping to static water pressure of 50 psig above operating pressures or 150 psig maximum without exceeding pressure rating of piping system materials. Allow the system to remain pressurized for 4 hours. Correct leaks and loss in pressure and retest system.
   2. Disinfect all domestic hot and cold water systems upon completion of final piping installation. Following disinfection, flush water from system through its extremities. Continue flushing until samples show quality is comparable with public water supply and complies with requirements of public health authority.

G. Sanitary Sewer Pipe Testing:
   1. Test drain, waste, and vent piping on completion of rough in. Close openings in piping system and fill with water to point of overflow but not less than 10 feet of head. Water level must not drop from 15 minutes before inspection starts through completion of inspection. Correct leaks and retest system.

H. Adjusting and Cleaning:
   1. General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush piping systems with clean water. Inspect each run of each system for completion of joints, supports and accessory items.
   2. Chemical Treatment: Provide a water analysis prepared by the chemical treatment supplier to determine the type and level of chemicals required for prevention of scale and corrosion. Perform initial treatment after completion of system testing.

3.3 COMMISSIONING (DEMONSTRATION)
   1. Fill system and perform initial chemical treatment.
   2. Check expansion tanks to determine that they are not air bound and that the system is completely full of water.
   3. Before operating the system, perform these steps:
   5. Remove and clean strainers.
   6. Check pump for proper rotation and proper wiring.
   7. Set automatic fill valves for required system pressure.
   8. Check air vents at high points of systems and determine if all are installed and operating freely (automatic type) or to bleed air completely (manual type).
   9. Set temperature controls so all coils are calling for full flow.
   10. Check operation of automatic bypass valve.
   11. Check and set operating temperature of converters and chillers to design requirements.
   12. Lubricate motors and bearings.

END OF SECTION 23 20 00
SECTION 23 30 00 - HVAC AIR DISTRIBUTION

PART 1 - GENERAL

1.1 SYSTEM DESIGN REQUIREMENTS

A. Ductwork:
   1. Fiberglass ductwork is not permitted.
   3. Pressure Classifications:
      a. Low Pressure: 1/2 inch WG positive or negative static pressure and velocities less than 2,000 fpm
   4. Plenums:
      a. Return air grilles for return air plenums shall have sound attenuation boots.

B. Duct Accessories:
   1. Flexible Duct:
      a. Provide additional flexible duct as required to meet the pressure class requirements.
      b. Maximum flexible duct length at each inlet/outlet shall be 6 feet.

C. Diffusers, Registers, Grilles:
   1. Provide for quantities and distribution patterns as shown on the drawings.

1.2 SUBMITTALS

1. Submit diffuser, register, and grille performance characteristics including, CFM ratings, pressure drops, NC levels, and throw patterns.

1.3 QUALITY ASSURANCE

A. SMACNA Standards:
   1. Comply with SMACNA’s “HVAC Duct Construction Standards, second edition”.
   2. Comply with SMACNA’s “HVAC Air Duct Leakage Test Manual”.


C. NFPA Compliance: Comply with NFPA 90A “Standard for the installation of Air Conditioning and Ventilating Systems” and NFPA 90B “Standard for the Installation of Warm Air Heating and Air Conditioning Systems”.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Flexible Duct:
      a. Flex-Master
      b. Thermaflex
      c. Hercules
   2. Grilles:
      a. Metalaire
      b. Titus
      c. Price
      d. Nailor
2.2 MATERIALS, GENERAL

A. Ductwork:
   1. Flexible Duct: Comply with UL 181, Class 1.
      a. Inner core of one ply corrugated aluminum duct, 1-inch thick, ¾ pound insulation and
         aluminized vapor barrier.

B. Grilles:
   1. General:
      a. Test and rate performance in accordance with ARI 880 and ASHRAE 70.
      b. Coordinate borders and mounting frames with ceiling and wall finish.
      c. Provide airflow capacity and throw patterns as shown. Pressure drops for return grilles
         shall not exceed 0.05 inch w.g. unless otherwise shown.
   2. Grilles:
      a. Perforated steel ceiling grille with 3/16-inch diameter holes on 1/4-inch staggered centers.
         Finish shall be white.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL:

A. Ductwork:
   1. Maximum flexible ductwork length at each inlet/outlet shall be 6 feet. Secure flexible ductwork to
      collars with metal bands. Support at least every 3 feet.

B. Sealing of Ducts:
   1. General:
      a. All ducts, seams, and joints (lateral and horizontal) shall be sealed with sealant.
      b. Metal surfaces to be joined shall be clean, dry, and grease free.
      c. Apply a heavy brush coat of sealant to the interior metal surface of the duct slip joint, then
         interlock securely the duct sections and position into place.
      d. Apply a heavy brush coat finish of sealant to the exterior metal surface duct joint or seam
         covering heads of lock joint screws. Ensure that all voids are completely filled to provide a
         continuous air pressure seal.
   2. Low pressure ducts: Seal in accordance with SMACNA standards for Class B seals.

C. Grille Installation:
   1. When installing grilles in existing drop ceilings provide additional T-sections as required for a
      finished opening for the grille.

END OF SECTION 23 30 00
SECTION 26 00 10--ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Conditions, Special Conditions, and Contract Documents are part of these specifications. Consult them further for instructions and be governed by the requirements contained there under.

1.2 DESCRIPTION

A. Work Included

1. Work shall consist of furnishing all labor, equipment, supplies and materials, unless otherwise specified, necessary for the installation of complete electrical systems as required by the specifications and as shown on the drawings, subject to the terms and conditions of the contract. The work shall also include the completion of those details of electrical work not mentioned or shown which are necessary for the successful operation of all electrical systems.

1.3 PROVISIONS

A. Work performed under this division of the specifications shall conform to the requirements of Division 1, the electrical drawings, and all items hereinafter specified.

1. Prior to any work being performed under this division, examine architectural, mechanical, specialty systems and interior design drawings and specifications. If any discrepancies occur between them and the electrical drawings and specifications, report discrepancies to the Architect in writing and obtain written instructions for the work.

2. Electrical drawings are diagrammatic, but shall be followed as closely as actual construction of the building will permit. All changes from drawings necessary to make the electrical work conform to the building as constructed shall be made without additional cost to the Owner.

3. Coordinate the electrical work with the General Contractor and be responsible to him for satisfactory progress of the same. Coordinate electrical work with all other trades on the project without additional cost to the Owner.

4. All work and materials covered by drawings and specifications shall be subject to review at any time by representatives of the Architect and Owner. If the Architect or Owner’s agent finds any materials or installation that does not conform to these drawings and specifications, Contractor shall remove the material from the premises and correct the installation to the satisfaction of the agent.

5. In acceptance or rejection of installed electrical systems, no allowance will be made for lack of skill on the part of the installers.

1.4 CODES AND STANDARDS

A. The latest editions of the following standards (including supplements and official interpretations) are minimum requirements:

1. NFPA 70 - National Electrical Code (NEC).
5. Conform to all applicable State and Local Codes.
8. Americans with Disabilities Acts (ADA) and American National Standards Institute (ANSI) 117.
9. National Electrical Manufacturer’s Association (NEMA).
10. Underwriter’s Laboratories (UL).
11. Insulated Cable Engineers Association (ICEA).
15. Institute of Electrical and Electronic Engineers (IEEE).
16. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

1.5 SPECIAL REQUIREMENTS

A. Definitions: “Provide” shall mean “furnish and install”. “Furnish” means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required for the proper and complete application. “Install” means to join, unit, fasten, link, attach, set up or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation. The words “accept” or “acceptable” denote only that the equipment items are in general conformance with the design concept of the project.

B. Drawings:

1. The drawings indicate the general arrangement of circuits and outlets, locations of switches, panelboards and other work. Information shown on the drawings is schematic, however, re-circuiting will not be permitted without specific acceptance. Drawings and specifications are complementary to each other. What is called for by one shall be as binding as if called for by both. Data presented on these drawings is accurate as planning can be determined, but accuracy is not guaranteed and field verification of all dimensions, locations, levels, etc., to suit field conditions is directed. Review all Architectural, Structural and Mechanical Drawings and Specifications; adjust all work to conform to all conditions shown therein. The Architectural drawings shall take precedence over all other drawings.

2. Discrepancies between different plans, between plans and specifications, between specifications or regulations and codes governing this installation shall be brought to the attention of the Architect in writing before the date of bid opening. In the event such discrepancies exist, and the Architect is not so notified, the adjudication of responsibility shall be solely at the discretion of the Architect.

1.6 EXAMINATION OF BIDDING DOCUMENTS

A. Each bidder shall examine the bidding documents carefully, and not later than seven days prior to the date of receipt of bids, shall make written request to the Engineer for interpretation or correction of any discrepancies, ambiguity, inconsistency, or error therein which he may discover. Any interpretation or correction will be issued as an addendum by the Architect. Only a written interpretation or correction by addendum shall be binding. No bidder shall rely upon interpretations or corrections given by any other method. If discrepancies, ambiguity, inconsistency, or error are not covered by addendum or written directive, Contractor shall include in his bid, labor materials and methods of construction resulting in higher cost. After award of contract, no allowance or extra compensation will be made on behalf of the Contractor due to his failure to make the written requests as described above.
B. Failure to request clarification during the bid period of any inadequacy, omission, or conflict will not relieve the Contractor of their responsibilities. The signing of the contract will be considered as implicitly denoting that the Contractor has a thorough comprehension of the full intent and scope of the working drawings and specifications.

1.7 PERMITS, FEES & NOTICES

A. Obtain and pay for all necessary permits, inspections and certificates that may be necessary for the full completion of the work. Furnish the Owner with a certificate of final inspection and approval from the AHJ over the electrical installation.

B. Notify proper authorities when work is ready for inspections required by applicable codes, rules and regulations, allowing sufficient time for inspections to be made without hindering progress of the work. Furnish to the Owner copies of inspection certificates of acceptance.

1.8 TESTS

A. Upon completion of all work and adjustment of all equipment, provide complete operational tests of all electrical equipment provided under this division.

1.9 WARRANTY

A. Guarantee that all work governed by this division shall be free of defects in workmanship, materials and parts for a period of one (1) year after written acceptance. Promptly repair, revise, and replace defects as directed with no additional cost to the Owner (lamps and fuses are exempt).

1.10 PROJECT/SITE CONDITIONS

A. Install work in locations shown on Drawings, unless prevented by Project conditions.

B. Prior to submitting a bid, visit the site of job and ascertain all conditions affecting the proposed installation and adjust all work accordingly. Make provisions for these costs.

C. Coordinate the work with that of all other trades. Where conflicts of work occur and departure from the indicated arrangements are necessary, consult with other Contractors involved; come to agreement as to changed locations and elevations, etc., and obtain written acceptance from the Architect of proposed changes before proceeding with work.

D. All outages of electrical service shall be scheduled with the Owner and Utility Company five (5) days in advance of proposed outage. Include an overtime allowance in the bid for the performance of all work requiring outages at such time as it is approved by the Owner. Outages shall be at a time and of such duration as accepted by the Owner.

1.11 SEQUENCING AND SCHEDULING

A. Construct Work in sequence under provisions of Division 1.
1.12 USE OF THE ARCHITECT’S AND/OR ENGINEER’S DRAWINGS

A. The Contractor shall obtain, at the Contractor’s expense, from the Architect or Engineer a set of AutoCAD or compatible format architectural and engineering drawings on electronic media where desired by the Contractor and/or required by the Specifications for use in preparing the shop drawings, coordination drawings, and record drawings. The Contractor shall provide to the Architect and Engineer a written release of liability acceptable to the Architect and Engineer prior to receiving the electronic media.

PART 2 - GENERAL

2.1 STANDARD FOR MATERIALS

A. All materials shall conform to current applicable industry standards. Workmanship and neat appearance shall be as important as the electrical and mechanical operation. Defective or damaged materials shall be replaced or repaired, prior to final acceptance, in a manner acceptable to the Architect or Owner at no additional cost to the Owner.

B. All electrical materials shall be acceptable for installation only if labeled or listed by a nationally recognized testing laboratory and if accepted by local authorities.

2.2 SUBMITTALS

A. Submit under provision of Division 1.

B. Listing of Equipment: The Contractor shall submit, within thirty days after the award of the contract, a complete typewritten list of those items of equipment which will be furnished under this contract. Include the name or description of the item, name of manufacturer, model, type, and catalog number.

C. Present shop drawing submittal data at one time, bound in three-ring binders, indexed in a neat and orderly manner. Partial submittals will not be accepted. Do not begin work until (1) copy is returned.

D. Submit five (5) copies of shop drawings, layouts, manufacturer's data, wiring diagrams and material schedules that may be requested by the Architect for his review. The review by the Architect will not constitute concurrence with any deviation from the plans and specifications unless such deviations are specifically identified by the method described below, nor shall it relieve the Contractor of responsibility for errors or omissions in the submitted data.

E. Processed shop drawings shall not be construed as change orders. The shop drawings shall demonstrate that the Contractor understands the design concept, indicate which equipment and materials he intends to provide, and detail the fabrication and installation methods he intends to use. If deviations, discrepancies or conflicts between shop drawing submittals and the design drawings and specifications are discovered, the design drawings and specifications shall govern.

F. Contractor shall be responsible for dimensions (which he shall confirm and correlate at the job site), fabrication processes and techniques of construction and coordination of his work with that of other trades. The Contractor shall check and verify all measurements and review shop drawings before submitting them and sign a statement on the shop drawings which signifies that they comply with plans and specifications and that equipment is dimensionally suitable for the application. If any deviations from the specified requirements for any item of material or equipment exist, such deviation shall be expressly stated in writing and incorporated with the submittal. The Owner's copies (two of each) of the
reviewed submittals shall be retained by the Contractor until completion of the project and presented in bound form to the Owner.

2.3 BID ALTERNATE(S)

A. Refer to Division 1 and all contract documents for additional information.

B. Alternate(s) for Material and Equipment

1. Equipment and material bid alternate(s) shall be proposed as additive or deductive alternate(s) to specified items by submitting it as a separate line item from the base bid on the Bidder's letterhead.

2. Such bid alternate proposals shall not be substituted or included in the base bid. Bid alternate proposal(s) must be accompanied by full descriptive data on the proposed equipment, together with a statement of the cost to be added or deducted for each item. The bid alternate shall include all materials, equipment, labor, electrical connections, coordination with all other trades, etc. for a complete and operational system.

3. The Contractor shall submit the bid alternates at the time the base bids are due.

2.4 SUBSTITUTION AND APPROVALS (Prior Approvals)

A. Prior to Bidding: Where items of equipment or materials are specified by a manufacturer's name, type, model, or catalog number, only those items may be used in the base bid unless prior written acceptance of other material has been published by addendum.

1. Submit applications for this review in triplicate at least ten (10) calendar days prior to bid opening.

2. Applications for review shall be accompanied by a typewritten list of the specified manufacturer and catalog number and shall state all significant details in which each items differs from the item specified. Failure to list this information shall not relieve the Contractor from providing properly functioning or fitting materials regardless of the review action taken by the Architect. The Contractor will provide only materials which have been specified or accepted prior to bid opening, under his base bid.

3. Equipment and materials not listed as equivalents may be proposed as deductive alternates to specified items by submitting it as a separate line item from the base bid on the Bidder’s letterhead.

4. Such substitution proposals shall not be substituted or included in the base bid. Substitution proposal must be accompanied by full descriptive data on the proposed equipment, together with a statement of the cost to be deducted for each item. If any such substitutions are considered, the Contractor shall submit a list of the proposed substitution items within 14 days of award of contract. The request for proposed substitutions shall not be accepted by the Engineer due to scheduling or delivery concerns.

B. Substitutions of Material after Award of Contract

1. Other items of material and equipment may be offered (at the Contractor's option) as alternates to specified items, either as provided for in the Proposal Forms or, if no provisions are made, by submitting it with his bid on the Bidder's letterhead.

2. Such alternate proposal shall not be included under the base bid and must be accompanied by full descriptive data on the proposed equipment, together with a statement of the cost to be added or deducted for each item. If any such alternate material proposals are considered, the Contractor
shall submit a list of the proposed alternate substitution items in accordance with the requirements of "Review of Proposed Substitutions".

2.5 SUBSTITUTIONS (CONTRACTOR AND/OR OWNER INITIATED)

A. Materials or equipment listed by several manufacturers’ names are intended to be bidder's choice, and any of the listed manufacturers may be used in the base bid. Materials or equipment not listed are considered substitutions.

B. Performance Specification: When any item is specified by requirement to meet a performance, industry or regulating body standard or is specified generically (no manufacturer's name listed), no prior review by the Consulting Electrical Engineer is needed unless specifically called for in these specifications.

C. Contractor to be responsible for any changes and costs to accommodate any equipment except the first named in the specification.

D. Substitutions for Material

1. Equipment and materials not listed as equivalents may be proposed as deductive alternates to specified items by submitting it as a separate line item to the base bid on the Bidder's letterhead.
2. Such substitutions shall not be substituted for the base bid and must be accompanied by a full description of the difference between the Contract Document requirements and that of the substitution, the comparative features of each, and the effect of the change on the end result performance. Include the impact of all changes on other contractors and acknowledge the inclusion of additional costs to the other trades. If any such alternates are considered, the Contractor shall submit a list of the proposed alternate substitution items within 14 days of award of contract. Late requests for proposed substitutions will not be accepted by the Engineer due to scheduling or delivery concerns.

PART 3 - EXECUTION

3.1 WORKMANSHIP AND COMPLETION OF INSTALLATION

A. Contractor's personnel and subcontractors selected to perform the work shall be well versed and skilled in the trades involved.

B. Coordinate electrical equipment and materials installation with other building components.

C. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.

D. Any changes or deviations from the drawings and specifications must be accepted in writing by the Architect/Engineer. All errors in installation shall be corrected at the expense of the Contractor. All specialties shall be installed as detailed on the drawings. Where detail or specific installation requirements are not provided, manufacturer's recommendations shall be followed.

E. Upon completion of work, all equipment and materials shall be installed complete, thoroughly checked, correctly adjusted, and left ready for intended use or operation. All work shall be thoroughly cleaned and all residue shall be removed from surfaces. Exterior surfaces of all material and equipment shall be delivered in a perfect, unblemished condition.
F. Contractor shall provide a complete installation, including all required labor, material, cartage, insurance, permits, and taxes.

3.2 PROGRESS OF WORK

A. Order the progress of electrical work to conform to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the building will permit. Any cost resulting from defective or ill-timed work performed under this Section shall be borne by this Contractor.

3.3 CHASES, OPENINGS, CUTTING, AND PATCHING

A. Carefully lay out all work in advance so as to eliminate where possible, cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings and roofs. Any damage to the building, structure, piping, ducts, equipment or any defaced finish shall be repaired by skilled mechanics of the trades involved at no additional cost to the Owner and to the satisfaction of the Architect. Any necessary cutting, channeling, drilling or anchoring of raceways, outlets, or other electrical equipment shall be performed in a careful manner, and as accepted by the Architect.

B. All openings made in fire-rated walls, floors, or ceilings shall be patched and made tight in a manner to conform to the fire rating for the surface penetrated.

C. All penetrations required through existing concrete construction shall be core drilled at minimum size required. Precautions shall be taken when drilling to prevent damage to structural concrete. Contractor shall obtain permission from the Architect before proceeding with drilling.

D. Provide all cutting, trenching, backfilling, patching and refinishing or resurfacing required for electrical work in a manner meeting the approval of the Engineer and at no additional cost to the Owner.

3.4 DELIVERY AND STORAGE OF MATERIALS

A. Arrange and be held responsible for delivery and safe storage of materials and equipment for electrical installation.

B. Store materials and equipment for easy inspection and checking.

C. Carefully mark and store all materials.

D. Deliver materials to the job site in stages of the work that will expedite the work as a whole.

E. Carefully check materials furnished to this Contractor for installation, and provide receipt acknowledging acceptance of delivery and condition of the materials received. Thereafter, assume full responsibility for its safekeeping until the final installation has been reviewed and accepted.

3.5 PROTECTION OF WORK AND PROPERTY

A. Where there are existing facilities, be responsible for the protection thereof, whether or not such facility is to be removed or relocated. Moving or removing any facility must be done so as not to cause interruption of the work of Owner’s operation.
B. Close all conduit openings with caps or plugs during installation. Cover all fixtures and equipment and protect against injury. At the final completion, clean all work and deliver in an unblemished condition, or refinish and repaint at the discretion of the Architect.

C. Any equipment or conduit systems found to have been damaged or contaminated above “MILL” or “SHOP” conditions shall be replaced or cleaned to the Engineer’s satisfaction.

3.6 FINAL ACCEPTANCE

A. Final acceptance by the Owner will not occur until all operating instructions are received and Owner's personnel have been thoroughly indoctrinated in the maintenance and operation of all equipment.

B. Operating manual, parts lists, and indoctrination of operating and maintenance personnel: Furnish the services of a qualified representative of the supplier for each item or system itemized below who shall instruct specific personnel, as designated by the Owner, in the operation and maintenance of that item or system.

C. Instruction shall be made when the particular system is complete and shall be of the number of hours indicated and at the time requested by the Owner. A representative of the Electrical Contractor shall be present for all demonstrations.

D. Deliver three (3) complete operating manuals and parts lists to the Owner (or his designated representative) at the time of the above required indoctrination. Fully explain the contents of the manuals as part of required indoctrination and instruct the Owner's personnel in the correct procedure in obtaining service, both during and after the guarantee period. The operating manual and parts lists shall give complete information as to whom the Owner shall contact for service and parts, including the address and phone number. Furnish evidence that an authorized service organization regularly carries a complete stock of repair parts for these items (or systems), and that the organization is available for service. Service shall be furnished within twenty four (24) hours after requested.

E. Clean up: Remove all materials, scrap, etc., relative to the electrical installation and leave the premises and all equipment, lamps, fixtures, etc. in a clean, orderly condition. Any costs to the Owner for clean up of the site will be charged against the Contractor.

F. Acceptance Demonstration: Upon completion of the work, at a time to be designated by the Architect, the Contractor shall demonstrate for the Owner the operation of the entire installation, including all systems provided under this contract.

3.7 CONSTRUCTION LIGHTING AND POWER

A. Provide all temporary facilities required to supply construction power and light. Install and maintain facilities in a manner that will protect the public and workmen. Comply with all applicable laws and regulations.

3.8 REMODELING PROVISIONS

A. Existing systems and conditions shown on the drawings are provided for guidance only. The Electrical Contractor shall field check all existing conditions prior to bidding and shall include in his bid an allowance for the removal and relocation of existing conduits, wires, devices, fixtures, or other equipment as indicated on the plans or as required to coordinate and adapt new and existing electrical systems to all other work required for this project.
B. Connect new work to existing in a manner that will assure proper raceway grounding throughout in conformance with the National Electrical Code.

C. Remodel Work Cutting and Patching: The Contractor shall perform cutting, channeling, chasing, drilling, etc., as required to install or remove electrical equipment in areas of remodeling. This work shall be performed so as to minimize damage to portions of wall finishes, surfaces, plastering, or the structure which are to be reused, resurfaced, plastered or painted under another division of these specifications.

D. Carefully coordinate with the required remodeling work, cutting and patching etc., performed by the other trades. Remove or relocate existing electrical conduits, wires, devices, fixtures and other equipment as necessary.

E. All outages on portions of existing electrical systems shall be minimized and shall be at a time and of duration as accepted by the Owner.

3.9 ELECTRICAL DEMOLITION

A. Examination

1. Verity field measurements and circuiting arrangements are as shown on drawings.
2. Verify that abandoned wiring and equipment serve only abandoned facilities.
3. Demolition drawings are based on casual field observation and existing record documents. Report discrepancies to Architect before disturbing existing installation.
4. Beginning of demolition means installer accepts existing conditions.

B. Preparation

1. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
2. Coordinate outages with Architect/Owner.
3. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

C. Demolition and Extension of Existing Electrical Work

1. Demolish and extend existing electrical work under provisions of Division 1, Division 2, and this section.
2. Remove, relocate, and extend existing installations to accommodate new construction.
3. Remove abandoned wiring to source of supply.
4. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
5. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets, which are not removed.
6. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
7. Repair adjacent construction and finishes damaged during demolition and extension work.
8. Maintain access to existing electrical installations, which remain active. Modify installation or provide access panel as appropriate.
9. Extend existing installations using materials and methods compatible with existing electrical installation, or as specified in individual section.

D. Cleaning and Repair
1. Clean and repair existing materials and equipment, which remain or are to be reused.
2. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

E. Installation

1. Install relocated materials and equipment under the provisions of Division 1.

3.10 OWNER PROVIDED EQUIPMENT

A. Provide electrical connections to owner furnished equipment.

B. Inspect owner furnished equipment for damage, defects, missing components, etc. Report deficiencies to the Owner immediately. Do not install or connect deficient equipment.

C. Provide supports, fastenings, and auxiliary hardware necessary for a complete installation in accordance with the finished building conditions.

END OF SECTION 26 00 10
SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 DESIGN REQUIREMENTS

1.2 DEFINITIONS

A. Refer to Article 100 of the currently adopted National Electrical Code for definitions as applicable to this project.

B. Other definitions:
   1. "Concealed": Embedded in masonry, concrete or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces, or in enclosures.
   2. "Exposed": Not installed underground or "concealed" as defined above.
   3. "Furnish" or "Provide": To supply, install and connect up complete and ready for safe and regular operation of particular work unless specifically otherwise noted.
   4. "Install": To erect, mount and connect complete with related accessories.
   5. "Indicated", "Shown" or "Noted": As indicated, shown or noted on drawings or specifications.
   6. "Related Work" includes, but is not necessarily limited to, mentioned work associated with, or affected by, the work specified.
   7. "Reviewed", "Satisfactory", "Accepted", or "Directed": As reviewed, satisfactory, accepted, or directed by or to Engineer.
   9. "Supply": To purchase, procure, acquire and deliver complete with related accessories.
   10. "Wiring": Raceway, fittings, wire, boxes and related items.

1.3 SUBMITTALS

A. Submittals shall be made in accordance with General Conditions of Contract and the requirements of Section 01 33 00.

B. Shop drawings shall include equipment catalog cuts or manufacturer's printed data identifying: dimensions, weights, recess openings, equipment arrangements, electrical characteristics with bus size, electrical rating, material, wiring diagrams indicating circuit arrangement and NEMA rating for, but not limited to the following:
   1. Wiring Devices
   2. Interior Lighting
   3. Hangers and Supports for Electrical Systems
   4. Grounding and Bonding

C. Submit composite coordination drawings to include location and routing of the electrical system components in relation to the mechanical ducts, piping and structural beams.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: All electrical work at the University shall be performed by a State of Colorado licensed contractor under the supervision of a licensed electrician. Contractors shall verify that electricians are currently licensed by the State of Colorado and shall supply Project Manager with names and license numbers. Contractor shall have a minimum of 3 years of satisfactory performance in conducting the type of work specified.
3. NECA - Standard of Installation.
5. IEEE – The Institute of Electrical and Electronics Engineers.
7. International Building Code in accordance with the Campus Building Official.
8. ASTM - American Society of Testing Materials
9. IPCEA - Insulated Power Cable Engineers Association
10. Underwriter's Laboratories (UL)
11. American National Standards Institute (ANSI)
12. Other requirements as listed elsewhere in these specifications.

B. The drawings and specifications take precedence when they are more stringent than codes, statutes, or ordinances in effect. Applicable codes, ordinances, standards and statutes take precedence when they are more stringent than, or conflict with the drawings and specifications.

C. Record Documents:
1. Maintain a separate set of contract electrical drawings at the site in accordance with Section 01 74 00 to show the following:
   a. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
   b. All branch circuits, feeders, communications conduits embedded in concrete, dimensioned from prominent building lines.
   c. Equipment locations (exposed and concealed) dimensioned from prominent building lines.
   d. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

D. Operations and Maintenance Data:
1. O and M Data shall be provided in accordance with Section 01 78 23 including the following information:
   a. Description of function, normal operating characteristics and limitations, fuse curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
   b. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
   c. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
   d. Servicing instructions and lubrication charts and schedules.
   e. Complete list of parts and wiring diagrams.
   f. Names, addresses and telephone numbers of the Contractor, Sub-contractors and local company responsible for maintenance of each system or piece of equipment.
   g. All information shall be permanently bound in a 3-ring binder. The job name and address, and Contractor's name and address shall be placed on the cover and spine of each binder in a permanent manner. Dymo-tape is not acceptable.
   h. Copies of all test reports shall be included in the manuals.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products in accordance with manufacturer's instructions, and the requirements of Section 01 10 00.

1.6 WARRANTY

A. All electrical equipment, materials and workmanship warranties shall be provided in accordance with the requirements of Section 01 78 36 and the following:
1. The Contractor warranties the electrical system, material and workmanship, for a period of one year from the date of the University final acceptance of the installation unless as otherwise noted in Commissioning.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. All equipment and materials installed shall be new, unless otherwise specified. Defective or damaged materials shall be replaced or repaired, prior to final acceptance, in a manner acceptable to the Engineer or The university and at no additional cost to the University.

B. All electrical materials shall be acceptable for installation only if labeled or listed UL and, if accepted, by the authority having jurisdiction.

C. All major equipment components shall have the manufacturer's name, address, model number, and serial number permanently attached in a conspicuous location.

D. Fire Seals:
   1. Material: Fire stopping material shall be asbestos free, 100% intumescent, have code approval under BOCA, ICBO, SSBC, NFPA 101, NFPA 70, and be capable of maintaining an effective barrier against flame and gases in compliance with the following requirements.
   2. Flame Spread: 25 or less, ASTM E84
   3. Fire Resistance and Hose Stream Tests: Fire stopping materials shall be rated “F” and “T” in accordance with ASTM E 814 or UL 1479. Rating periods shall conform to the following:

| F  | T  |  
|----|----|---
| 3  | 3  |  
| 3  | 3  |  

   - (F) 3 (T) 3 Time-rated floor or wall assemblies.
   - (F) 3 (T) 3 Openings between floor slabs & curtain wall.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Construct Work in sequence under provisions of Division 1 where applicable.

B. Electrical Contractor shall coordinate Divisions 26, 27, and 28 work with the installer of Division 21, 22 and 23 and other work to ensure that code required clearances relating to space required for access to electrical equipment is properly maintained.

C. Install Work using procedures defined in NECA Standard of Installation.

D. Workmanship shall conform to highest industry standards for each trade involved in installation of the Work.

E. Upon completion of work, all equipment and materials shall be installed complete, thoroughly checked, correctly adjusted, and left ready for intended use or operation. All work shall be thoroughly cleaned and all residues shall be removed from surfaces.

F. Exterior surfaces of all material and equipment shall be delivered in a perfect, unblemished condition.

G. Carefully lay out all work in advance so as to eliminate where possible, cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings and roofs. Any damage to the building, structure, piping, ducts, equipment or any defaced finish shall be repaired by skilled mechanics of the trades involved at no additional cost to the University.
H. All openings made in fire-rated walls, floors, or ceilings shall be patched and made tight in a manner to conform to the fire rating for the surface penetrated. Paint to match surface when visible.

I. All penetrations required through completed concrete construction shall be core drilled at minimum size required. Precautions shall be taken when drilling to prevent damage to structural concrete. The Contractor shall obtain permission from the Architect and Structural engineer before proceeding with drilling.

J. Sleeve Seals: Provide sleeve seals for penetrations located in foundation walls below grade, or in exterior walls, of one of the following:
   1. Caulk between sleeve and raceway with approved Caulk material.
   2. Mechanical Sleeve Seals: Modular mechanical type, as manufactured by Thunder line Corp., consisting of interlocking synthetic rubber links shaped to continuously fill annular space between raceway and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal.

K. Install equipment and materials to provide required Code clearances and access for servicing and maintenance. Coordinate the final location with piping, ducts, and equipment of other trades to insure proper access for all trades. Coordinate locations of concealed equipment, disconnects, and boxes with access panels and doors. Allow ample space for removal of parts, fuses, lamps, etc., that require replacement or servicing according to the National Electric code and the AHJ.

L. Extend all conduits so that junction and pull boxes are in accessible locations.

M. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

N. Electrical system layouts indicated on drawings are generally diagrammatic but shall be followed as closely as actual construction and work of other trades will permit. Govern exact routing of raceways and locations of outlets by structure and equipment served. Take all dimensions from engineering drawings.

O. Consult all other drawings. Verify all scales and report any dimensional discrepancies or other conflicts to Engineer before submitting bid.

P. All home runs to panel boards are indicated as starting from outlet nearest panel and continuing in general direction of that panel. Continue such circuits to panel as though routes were completely indicated.

Q. Furnish and install all necessary hardware, hangers, blocking, brackets, bracing, runners, etc. required for equipment specified under this Division.

R. Clean all luminaries, lamps and lenses prior to final acceptance. Replace all inoperative lamps.

3.2 TESTING, CLEANING AND CERTIFICATION

A. Clean-Up: Remove all materials, scrap, etc., relative to the electrical installation, and leave the premises and all equipment, lamps, fixtures, etc. in a clean, orderly condition. Any costs to the University for clean up of the site will be charged against the Contractor.

3.3 COMMISSIONING (DEMONSTRATION)

A. Acceptance Demonstration: Upon completion of the work, at a time to be designated, the Contractor shall demonstrate for the University the operation of the entire installation, including all systems provided under this contract.
B. The Contractor shall furnish the services of a qualified representative of the supplier of each item or system who shall instruct specific personnel, as designated by the University, in the operation and maintenance of that item or system.
   1. Instruction shall be given when the particular system is complete, and shall be of the number of hours indicated. A representative of the Contractor shall be present for all demonstrations.

END OF SECTION 26 05 00
SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUBMITTALS

A. Product data shall be submitted for in accordance with the requirements of Section 26 05 00 each of the following:
   1. Wires
   2. Cables
   3. Connectors

1.2 QUALITY ASSURANCE

A. Wire and cable shall be provided and installed in accordance with the requirements of Section 26 05 00.

B. Installer Qualifications and Certifications: Firms with at least 3 years of successful installation experience with projects utilizing electrical wiring cabling work similar to that required for this project.

C. Regulatory Requirements: Conform to applicable code relations regarding toxicity of combustion products of insulating materials

D. Manufacturers: Firms regularly engaged in manufacture of electrical wire and cable products of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Wire and cable shall be delivered, stored and handled in accordance with the requirements of Section 26 05 00.

B. Deliver wire and cable properly packaged in factory-fabricated type containers, or wound on NEMA-specified type wire and cable reels.

C. Store wire and cable in clean dry space in original containers. Protect products from weather, damaging fumes, construction debris and traffic.

D. Handle wire and cable carefully to avoid abrading, puncturing and tearing wire and cable insulation and sheathing. Ensure that dielectric resistance integrity of wires/cables is maintained.

1.4 WARRANTY

A. Wire and cable warranties shall be provided in accordance with the requirements of Section 26 05 00.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the following (for each type of wire, cable, and connector):
   1. Wire and cable:
      a. Triangle - PWC
b. American Wire and Cable Co.
c. Anaconda-Ericsson Inc; Wire and Cable Div.
d. Belden Div; Cooper Industries
e. General Cable Corporation
f. General Electric
g. Okonite

2. Connectors:
   a. O-Z/Gedney Co.
   b. AMP, Inc.
   c. Burndy Corporation
   d. Ideal Industries, Inc.
   e. 3M Company
   f. Thomas and Betts Corp.

2.2 MATERIALS, GENERAL

A. Wires and Cables:
   1. Provide new wire and cable suitable for the temperature, conditions, and location where installed. All cable shall be new and shall conform to or exceed IPCEA requirements. Building wire shall be insulated with THHN/THWN/THW or XHHW insulation, rated 600 volt.
   2. Conductors: Provide solid conductors for power and lighting circuits 12 AWG and smaller. Provide stranded conductors for 10 AWG THHN/THWN and larger. In sizes 250 MCM and larger use type THW or THWN. In sizes #1 AWG and smaller all conductors shall have heat/moisture resistant thermoplastic insulation type THW or THWN (75 degree C), except as follows:
      a. Where conduit temperature will exceed 100 degree F, use type THHN (90 degree C). Type XHHW (90 degree C) permissible in dry locations.
      b. In 120-volt incandescent fixtures, type AF (150 degree C).
      c. In wire ways of fluorescent lighting fixtures types THW-MTW, THHN (90 degree C).
   3. Conductor Material: Provide copper for all wires and cables.
   4. Metal Clad cable is acceptable.
   5. Use colors of wires as specified in paragraph 3.5 of this section.
   6. For general applications, other than special use, use THHN/THWN insulated wire.
   7. Type NM, NMC, NMS cable are not acceptable for any application.
   8. No wire splices shall be allowed in the conduit or conduit fittings. All splices shall be done in an approved box.
   9. Grounding conductors shall be copper type THHN with green integrally-colored insulation, sized to meet NEC.
   10. Plenum rated cable when required by Plenum conditions.

B. Connectors:
   1. Provide UL type factory-fabricated, solder less metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Use connectors with temperatures equal to or greater than those of the wires upon which used.

C. Wiring to Light Fixtures:
   1. Type THHN/THWN to fluorescent light fixtures, 12-gauge minimum.
   2. Type THHN/THWN to incandescent fixtures, 12-gauge minimum.

D. Wire Connectors:
   1. For wires size #8 AWG and smaller, insulated pressure type (with live spring) rated 105 degree C, 600 volt, for building wiring and 1000 volt in signs or fixtures. 3M or Ideal.
   2. For wires size #6 AWG and larger, T & B or equivalent compression type with 3M #33 or #88 tape insulation.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that mechanical work likely to damage cable has been completed.

3.2 INSTALLATION, GENERAL

A. Install electrical cables, wires and connectors in compliance with applicable requirements of NEC, NEMA, UL, and NECA’s “Standard of Installation”, and in accordance with recognized industry practices.

B. Coordinate wire/cable installation work, including electrical raceway and equipment connection work, with other work. Pull no wire into any portion of conduit system until all construction work, which might damage the wire, has been completed.

C. Wires and Cables:

1. Use pulling means including, fish tape, cable, rope and basket weave wire/cable grips which will not damage cables or raceway. Do not use rope hitches for pulling attachment to wire or cable. Do not exceed manufacturer's tension requirements.

2. Keep conductor splices to minimum. Install all wire continuous from outlet to outlet or terminal to terminal. Splices in cables when required shall be made in hand holes, pull boxes, or junction boxes and shall be in strict accordance with cable manufacturer’s recommendations utilizing solderless connectors NEMA/UL approved for the use. Splice only in accessible junction boxes. Use splices and tap connectors which are compatible with conductor material.

3. Install splices and tapes, which possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.

4. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer’s published torque tightening values. Where manufacturer’s torque requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486 for copper.

5. Support cables above accessible ceilings, do not rest on ceiling tiles. Use spring clips and hanger rods, bridles rings or ‘J’ hooks, independent from the ceiling suspension system to support cables from structure.

6. Provide adequate length of conductors within electrical enclosures and form the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than 10 AWG cables to individual circuits. Make terminations so there is no bare conductor at the terminal.

7. Make up splices in outlet boxes with 8-inch minimum of correctly color-coded tails left in box. Splices in wires size #8 AWG and smaller shall be made with insulated spring type wire connectors, “Scotchlok” or equivalent. Splices in larger wire and cables shall be made with indent connectors NEMA/UL approved for the purpose.

8. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

9. Thoroughly tape the ends of spare conductors in boxes and cabinets.

10. Install exposed cable, parallel and perpendicular to surfaces, or exposed structural member, and follow surface contours, where possible.

11. Make all ground, neutral and line connections to receptacle and wiring device terminals as recommended by manufacturer. Provide ground jumper from outlet box to individual ground terminal of devices.

12. Parallel conductors shall be cut to the same length and be the same type of wire.

13. All splices in control panels, terminal junction boxes, low voltage control circuits and fire alarm conductors shall be on numbered terminal strip.

14. When routed in a wall, install all thermostat wire, fire alarm, computer cable, low voltage cable, and other communication cable in conduit.
15. All junction boxes shall be fully accessible.
16. All wiring shall be routed through an acceptable raceway regardless of voltage application, unless specified otherwise under other sections of these standards.

3.3 TESTING, CLEANING AND CERTIFICATION

A. Refer to Section 26 05 00 for testing, cleaning, and certification requirements.

B. Prior to energizing circuitry, check installed wires and cables with megaohm meter to determine insulation resistance levels to ensure requirements are fulfilled. Test shall be made on all feeders regardless of size and on all branch circuits with No. 4 AWG and larger conductors.

C. Prior to energizing, test wires and cables for electrical continuity and for short-circuits.

D. Subsequent to wire and cable hook-up, energize circuitry and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

3.4 SCHEDULES

A. Color code secondary service, feeder, and branch circuit conductors as follows:

<table>
<thead>
<tr>
<th>120/208 Volts</th>
<th>277/480 Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Brown</td>
</tr>
<tr>
<td>Red</td>
<td>Orange</td>
</tr>
<tr>
<td>Blue</td>
<td>Yellow</td>
</tr>
<tr>
<td>White</td>
<td>Gray</td>
</tr>
<tr>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Switch leg - Pink</td>
<td>Purple</td>
</tr>
<tr>
<td>3 &amp; 4 way travelers - Purple</td>
<td></td>
</tr>
</tbody>
</table>

B. Conductors shall be solid color for entire length.

C. EXCEPTION:

1. Conductors 8 AWG and larger may be black and shall be with color-coded at each termination and in each box or enclosure. For a distance of 6 inches use half-lapped 3/4 inch plastic tape in the specified color. Do not cover cable identification markings. Adjust tape locations to prevent covering of markings.

END OF SECTION 26 05 19
SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL (NOT APPLICABLE)

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Provide a separate insulated equipment-grounding conductor in all feeders. Terminate each ground conductor to the bushing and ground lug.

B. All grounding materials shall be copper with the exception of ground rod, which may be copper clad steel.

C. Provide a corrosion-resistant finish to field connections, buried metallic bonding products, and where factory applied protective coatings have been destroyed, where subject to corrosive action.

D. Provide an equipment-grounding conductor in all nonmetallic and flexible conduits.

E. Provide equipment-grounding conductor in all branch circuits. Route to switches, receptacles, equipment enclosures, equipment, and panels etc. and ground as required.

F. Use mechanical grounding connectors for all grounding connections. Exothermic welded connections may be used underground or to building steel.

G. Minimum ground resistance:

<table>
<thead>
<tr>
<th>Table</th>
<th>Earth Ground Resistance to Equipment (Ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td></td>
</tr>
<tr>
<td>Secondary neutrals and other ground</td>
<td>10</td>
</tr>
</tbody>
</table>

H. Provide a separate insulated equipment-grounding conductor in feeder and branch circuits. Terminate each end on a grounding lug, buss or bushing.

I. Provide grounding bushings and bonding jumpers for all conduits terminating in reducing washers, concentric, eccentric or oversized knockouts at panel boards, cabinets, and gutters.

J. Provide bonding wire in all flexible conduits.

END OF SECTION 26 05 26
SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESIGN REQUIREMENTS

A. Provide equipment supports rated for the supported loads.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Conduit Hangers: Galvanized steel with special accessories for purpose and adequate to support load imposed.

B. Coatings: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance-using NEMA/UL approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be hot-dip galvanized.

C. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, and wall brackets.

D. Fasteners: Types, materials, and construction features as follows:
   1. Expansion Anchors: Carbon steel wedge or sleeve type.
   2. Toggle Bolts: All steel springhead type.

E. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.

F. U-Channel Systems: 16-gauge steel channels, with 9/16-inch-diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacture.

G. Supports: Provide supporting devices of types, sizes and materials indicated; and having the following construction features:
   1. One-Hole Conduit Straps or Minerallac: For supporting 3/4 inch and smaller conduit, galvanized steel.
   2. Two-Hole Conduit Straps or Minerallac or industry approved equal: For supporting 1 inch and larger conduit, galvanized steel; 3/4 inch strap width; and 2-1/8 inch between center of screw holes.

H. Fabricated Supporting Devices:
   1. General: Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
   2. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
   3. Pipe Sleeves: Provide pipe sleeves of one of the following:
      a. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snap lock joint, welded spiral seams, or welded longitudinal joint.
      b. Fabricate sleeves from the following gauge metal for sleeve diameter noted:
         1) 3-inch and Smaller: 20 gauge
         2) 4-inch to 6-inch: 16 gauge
3) Over 6-inch: 15 gauge
   c. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
   d. EMT, IMC, or Rigid Conduit.

I. J-Hooks and Bridle Rings
   1. J-hooks and bridle rings may be used to support low voltage wiring systems.

J. The following are prohibited.
   1. Plastic or fiber anchors.
   2. Drilling or structured steel members.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Conduit Hangers: Support individual conduit 1-1/2 inch and larger and all multiple conduit runs with hangers. Clamp conduits individually to each support.

B. Supports and Hangers:
   1. Support and align all raceways, cabinets, boxes, fixtures, etc., in an accepted manner and as herein specified. Support raceways on accepted types of wall brackets, specialty steel clips or hangers, ceiling trapeze hangers or malleable iron straps. Provide lead expansion shields in concrete, machine screws, bolts or welding on metal surfaces, and wood screws on wood construction. Use of powder-driven studs is prohibited without express permission from the University Project Manager.
      a. Mount all conduits to structure a minimum of 7 inches above any accessible type ceiling, or with spacing as required to permit relocation of recessed fixtures to any location.
   2. Structural and post tensioned concrete members shall not be drilled or pierced without prior approval from the University Project Manager.
   3. Where outlets are installed in steel stud type systems, provide additional cross bracing, bridging and/or straps as required to make outlet completely rigid prior to application of wall facing material.
   4. Design hangers and wall brackets so that maximum deflection will be no greater than 1/8 inch.
   5. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
   6. Coordinate with the building structural system and with other electrical installation.

C. Raceway Supports: Comply with the NEC and the following requirements:
   1. Conform to manufacturer's recommendations for selection and installation of supports.
   2. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 pounds, provide additional strength until there is a minimum of 200 pounds safety allowance in the strength of each support.
   3. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
   4. Use of ceiling support wires is unacceptable.
   5. Support parallel runs of horizontal raceways together on trapeze-type hangers. Use 3/8-inch diameter or larger threaded steel rods for support. Threaded rod shall be covered by ½ inch conduit from bottom of (trapeze) support to 6-inches above cable tray.
   6. Support individual horizontal raceways by separate pipe hangers.
   7. Space supports for raceways in accordance with NEC.
   8. In all runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
   9. Threaded rod supports to have bottoms cut off at a maximum length equal to rod diameter below bottom double nut. Remove sharp edges.
D. Miscellaneous Supports: Support miscellaneous electrical components separately and as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panel boards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.

E. Sleeves: Install in walls and all other fire-rated floors and walls for raceways and cable installations as required. Where sleeves through floors are installed, extend above finish floor. For sleeves through fire rated-wall or floor construction, apply UL listed fire stopping sealant in gaps between sleeves and enclosed conduits and cables. See Engineering plans for location and extent of fire rated assemblies.

F. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, bus ways, cabinets, panel boards, transformers, boxes, disconnect switches, and control components in accordance with the following:
1. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Powder-driven studs are not acceptable. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
2. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
3. Ensure that the load applied to any fastener does not exceed 25% of the proof test load. Use vibration- and shock-resistant fasteners for attachments to concrete slabs.

END OF SECTION 26 05 29
SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL (NOT APPLICABLE)

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Conduit: Allied
      a. Republic
      b. Carlon
   2. Fittings and Bodies:
      a. O/Z Gedney
      b. Regal was purchased by Bridgeport
      c. Bridgeport
      d. Raco
      e. Appleton
   3. Conduit Seals:
      a. Chase-Foam CTC PR-855, or approved equal

2.2 MATERIALS, GENERAL

A. Metal Conduit and Tubing:
   1. Electrical Metallic Tubing (EMT):
      a. Conduit: Galvanized steel tubing, galvanized on the outside and coated on the inside with a hard smooth lacquer finish. Fittings: Steel compression fittings for rain-tight and concrete-tight applications. Steel set-screw for interior connections. Set-screw quick fit type for 2-1/2 inch and larger may be used. Bushings shall be threaded and have nylon insulated throat or nylon bushing.
   2. Rigid Aluminum Conduit:
      a. Not allowed unless otherwise noted.
   3. Flexible Metal Conduit:
      a. Conduit: Continuous spiral wound, interlocked, zinc-coated steel, NEMA/UL approved for grounding.
      b. Fittings: Cadmium plated, malleable iron. Straight connector shall be one-piece body, female end with clamp and deep slotted machine screw for securing conduit, and threaded male end provided with a locknut. Angle connectors shall be two-piece body with removable upper section, female end with clamp and deep slotted machine screw for securing conduit, and threaded male end provided with a locknut. All fittings 1 inch and larger shall be terminated with threaded bushings having nylon insulated throats.
      c. Maximum length of 6 feet.
      d. Minimum size of 1/2 inch.

B. Conduit Bodies:
   1. General: Types, shapes and sizes, as required to suit individual applications and National Electric Code (NEC) requirements. Provide matching gasket covers secured with corrosion-resistant screws.
   2. Metallic Conduit and Tubing: Use metal conduit bodies. Use bodies with threaded hubs for threaded raceways and in hazardous locations.
   3. Telephone EL's are not acceptable.

2.3 MATERIALS, GENERAL
A. Sheet Steel: Flat rolled, code-gage, galvanized steel.

B. Fasteners for General Use: Corrosion resistant screws and hardware including cadmium and zinc plated items.

C. Fasteners for damp or wet locations: Stainless steel screws and hardware.

D. Exterior Finish: Gray baked enamel for items exposed in finished locations except as otherwise indicated.

E. Metal outlet, device, and small wiring boxes:
   1. General: Boxes shall be of type, shape, size, and depth to suit each location and application.
   2. Steel Boxes: Boxes shall be sheet steel with stamped knockouts, threaded screw holes and accessories suitable for each location including mounting brackets and straps, cable clamps, exterior rings and fixture studs.

F. Outlet Boxes, Pull and Junction Boxes (J-Boxes):
   1. General: Boxes shall have screwed or bolted-on covers of material same as box and shall be of size and shape to suit application.
   2. Steel Boxes: Sheet steel with welded seams. Where necessary to provide a rigid assembly, construct with internal structural steel bracing.
   3. Hot dipped galvanized steel boxes: Sheet steel with welded seams. Where necessary to provide a rigid assembly, construct with internal structural steel bracing. Hot-dip galvanized after fabrication. Cover shall be gasketed.
   4. Outlet Boxes: Hot-dipped galvanized of required size, 4 inch square, 2 inch depth minimum or octagonal and of depth required for flush mounted devices and lighting fixtures. Cast-type with gasketed covers for surface-mounted devices. All outlets for exterior application shall be cast, weatherproof type with gasket and cast cover plate.
   5. Junction and Pull Boxes: Use outlet boxes as J-boxes wherever possible. Larger J-boxes pull boxes shall be accessible and shall be fabricated from sheet steel, sized according to code.

G. Non metallic boxes are not permitted.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Conduit Sizes:
   1. The conduit shall be sized in accordance with NEC.
      a. For power and lighting circuits, the minimum conduit size shall be 3/4”
      b. Flexible and Liquid-tight Flexible Conduit: 1/2 inch for all runs. Maximum 6-foot length.
      c. Conduits used for home runs shall contain only the conductors for the circuits indicated on the drawings. Combining unrelated multiple home runs into a single conduit would not be permitted.

B. Type of Conduit Used
   1. Electrical Metallic Tubing (EMT):
      a. Interior concealed spaces.
      b. Interior exposed above 10 feet to floor.
      c. Not permitted underground, in concrete, and in hazardous or corrosive areas.
   2. Sealtite metal conduit shall be provided for: Makeup of motor, transformer or equipment, and/or raceway connections where isolation of sound and vibration transmission is required. For connections in locations exposed to weather, or in interior locations subject to moisture, watertight flexible conduit shall be used.
   3. Non-metallic Rigid Conduit:
      a. In concrete and underground.
b. Not permitted for interior use.

C. General: Install electrical raceway in accordance with manufacturer’s written installation instructions, applicable requirements of NEC, and as follows:

1. Conceal all conduits unless indicated otherwise, within finished walls, ceilings, and floors. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes.
2. Elevation of Raceway: Where possible, install horizontal raceway runs above water and steam piping, keep close to structure.
3. Complete installation of electrical raceways before starting installation of conductors within raceways.
4. Provide supports for raceways as required per NEC. Prevent foreign matter from entering raceways by using temporary closure protection.
5. Make bends and offsets so the inside diameter is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel. All bends shall be made in an approved bending machine or factory-made. Hickey bends will not be permitted in conduits larger than 3/4 inch. Refer to Section 2705.28 for special bending requirements for Telecommunications Systems.
6. Use raceway fittings that are of types compatible with the associated raceway and suitable for the use and location. Install expansion fittings across all structural construction joints and expansion/deflection couplings across all structural expansion joints and in every 200 feet of linear conduit run. A flexible bonding jumper at least three times the nominal width of the joint shall be installed.
7. Run concealed raceways parallel and perpendicular to building elements at right angles.
8. Install exposed raceways parallel and perpendicular to nearby surfaces or structural members and follow the surface contours as much as practical. Paint all exposed raceways to match surrounding area.
9. Run exposed and parallel raceways together. Make bends in parallel runs from the same centerline so that the bends are parallel. Factory elbows may be used only where they can be installed parallel. In other cases, provide field bends for parallel raceways.
10. Make raceway joints tight. Where joints cannot be made tight, use bonding jumpers to provide electrical continuity of the raceway system. Make raceway terminations tight. Where terminations are subject to vibration, use bonding bushings or wedges to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors. Joints in non-metallic conduits shall be made with solvent cement in strict accordance with manufacturer’s recommendations.
11. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely and install the locknuts with dished part against the box. RGC shall be secured with double locknuts and an insulated metallic bushing. EMT shall be secured with one locknut and shall have nylon-insulated throats or threaded nylon bushings from 1/2 inch to 1 inch. 1-1/4 inch and above shall be metal with nylon insulated throats. Use grounding type bushings for feeder conduits at switchboards, panel boards, pull boxes, transformers, motor control centers, VFDs, etc.
12. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.
13. Flexible Connections: Use short length (maximum of 6 feet) of flexible conduit for recessed and semi-recessed lighting fixtures, for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquid tight flexible conduit in wet locations. Install separate ground conductor in all flexible connections.
14. Conduit Seals: Conduit passing through concrete walls shall be sealed.
15. Where conduits are to be installed through structural framing members, the contractor shall provide sleeves. Cut all openings in concrete with rotary type drill, or other method as approved by the University Project Manager. Holes cut with pneumatic hammer will not be accepted. For areas where sleeves have not been provided, the Engineer’s written approval must be obtained prior to cutting, notching or drilling of structural framing members.
16. Ream the ends of all cut and/or threaded conduit. Ends shall be cut square.
17. Use of running threads for rigid metallic conduit are not permitted. When threaded couplings cannot be used, provide 3-piece union or solid coupling.

18. Conduits shall not cross pipe shafts or ventilation duct openings “access panel”.

19. Conduit shall not obstruct full and direct access to equipment requiring maintenance. This includes but is not limited to valves, actuators and terminal box controllers.

20. Install an insulated ground conductor in all conduits.

21. Where individual conduits penetrate fire-rated walls and floors, provide pipe sleeve one size larger than conduit; pack void around conduit with fire rated insulation and seal opening around conduit with UL Listed foam silicone elastomer compound. Conduits on trapeze type support system shall require fire taping only.

22. Where conduit sleeves penetrate fire rated floors or walls for installation of system cables, AC or MC cables, or modular wiring cables, pack void around cables or empty sleeve with fire rated insulation and fill ends with fire-resistive compound. Seal opening around sleeve with UL Listed foam silicone elastomer compound.

23. Provide separate raceway systems for each of the following:
   a. Lighting
   b. Power Distribution
   c. Emergency (Essential)
      1) Lighting
      2) Power distribution
   d. Low voltage systems, including telephone and communications, EQ alarm, security, fire alarm.
   e. Audio/Visual

24. If type MC or AC cable is used for branch circuits, the home run conduit will be EMT and must run from the panel to within 10 feet horizontally of the first device served.

D. Raceway Installation:
1. Surface raceways, where indicated on drawings, shall be metal and of a size approved for number and size of wires to be installed, shall be installed in a neat, workmanlike manner, with runs parallel or perpendicular to walls and partitions. Raceways, elbows, fittings, outlets and devices shall be of same manufacturer, and designed for use together.

3.2 INSTALLATION, GENERAL

A. Boxes:
1. Every J-box shall be secured, independent of conduit entries into the box. Boxes shall be secured to the building structure. Ceiling wire shall not be used to support (secure) J-boxes.
2. Box fill shall be governed by code requirements. Only the allowable amount of conduit entries shall be allowed into the box.
3. Box covers shall be marked so as to indicate the voltage, panel number, and circuit number of the enclosed conductors.
4. Each J-box shall have only one voltage installed.
5. Cap unused knockout holes where blanks have been removed and plug unused conduit hubs.
6. Sizes shall be adequate to meet NEC volume requirements, but in no case smaller than sizes indicated.
7. Remove sharp edges where they may come in contact with wiring or personnel.
8. All conduits connected to a flush panel shall be concealed.

B. Outlet Boxes:
1. Exact location of outlets and equipment shall be governed by structural conditions and obstructions or other equipment items. When necessary, relocate outlets so that when fixtures or equipment are installed, they will be symmetrically located according to room layout and will not interfere with other work or equipment. Verify final location of all outlets, panels, equipment, etc. with the University Project Manager.
2. Outlets at windows and doors: Locate close to window trim in an accessible location. For outlets indicated above doors center outlets above the door opening except as otherwise indicated.
3. Column and pilaster locations: Locate outlet boxes for switches and receptacles on columns or pilasters so the centers of the columns are clear for future installation of partitions. Locate in an accessible location.

4. Locations in special finish materials: For outlet boxes for receptacles and switches mounted in desks or furniture cabinets or in glazed tile, concrete block marble, brick, stone or wood walls, use rectangular shaped boxes with square corners and straight sides. Install such boxes without plaster rings. Saw cut all recesses for outlet boxes in exposed masonry walls.

5. Mounting: Mount outlet boxes for switches and receptacles with the long axis vertical or as indicated. Three or more gang boxes shall be mounted with the long axis horizontal. Locate box covers or device plates so they will not span different types of building finishes either vertically or horizontally. Locate boxes for switches near doors on the strike side, close to door trim. Provide far side box supports for electrical boxes installed on metal studs.

6. Ceiling outlets: For fixtures, where wiring is concealed, use outlet boxes 4-inches square by 1-1/2 inches deep, minimum.

7. Protect outlet boxes to prevent entrance of plaster, and/or debris. Thoroughly clean foreign material from boxes before conductors are installed.

8. Existing outlet boxes: Where extension rings are required to be installed, drill new mounting holes on the existing boxes where existing holes are not aligned.

9. Back to back outlet boxes are not permitted. Separate boxes a minimum of 6 inches in standard walls and 24 inches in acoustical walls.

C. Installation of Pull and J-Boxes:

1. Box selection: For boxes in main feeder conduit runs, use minimum 8-inches square by 4-inches deep or as needed per NEC. Do not exceed 6 entering and 6 leaving raceways in a single box.

2. Cable supports: Install clamps, grids, or devices to which cables may be secured. Arrange cables so they may be readily identified. Support cable at least every 30 inches inside boxes.

3. Mount pull boxes in inaccessible ceilings with the covers flush with the finished ceiling.

4. Every J-box shall be secured, independent of conduit entries into the box. Boxes shall be secured to the building structure. Provide rigid supports for all J-boxes, ceiling wire supports are not acceptable.

5. Box fill shall be governed by code requirements. Only the allowable amount of conduit entries shall be allowed into the box.

6. Box covers shall be marked so as to indicate the voltage, panel numbers, and circuit number of the enclosed conductors. Use pre-printed labels, marking cover with permanent marker is not acceptable.

D. Grounding:

1. Electrically ground metallic cabinets, boxes, and enclosures. Where wiring to item includes a grounding conductor, provide a grounding terminal in the interior of the cabinet, box or enclosure.

E. Outlets:

1. Provide zinc-coated or cadmium-plated sheet steel outlet boxes not less than 4 inch octagonal or square, unless otherwise noted. Equip fixture outlet boxes with 3/8-inch no-bolt fixture studs. Where fixtures are mounted on or in an accessible type ceiling, provide a J-box and extend flexible conduit, maximum 6' to each fixture. Outlet boxes in finished ceilings or walls shall be fitted with appropriate covers, set to come flush with the finished surface. Where more than one switch or device is located at one point, use gang boxes and covers unless otherwise indicated. Sectional switch boxes or utility boxes will not be permitted. Provide tile box or a 4-inch square box with tile ring where "drywall" type materials are applied.

F. Pull and J-Boxes and Cabinets:

1. Construct J-boxes or pull boxes not over 150 cubic inches in size as standard outlet boxes, and those over 150 cubic inches the same as "Cabinets," with hinged covers of same gauge metal. Removable covers must be accessible at all times.

2. Provide a standard access panel having a hinged metal door neatly fitted into a flush metal trim, where a J-box or equipment is located above non-accessible ceilings or behind finished walls.
Coordinate location and type with the University Project Manager. Access panels shall be minimum 24”x24” or 6” larger than pull box.

3. All cabinets shall be set rigidly in place with fronts straight and plumb, center panel board interiors in door openings.

END OF SECTION 26 05 33
SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUBMITTALS
1. Samples of each color, lettering style, and other graphic representation required for identification materials; samples of labels and signs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Ideal Industries, Inc.
   2. LEM Products, Inc.
   3. Markal Corp.
   4. Panduit Corp.
   5. W.H. Brady, Co.

2.2 MATERIALS, GENERAL

A. Nameplates: Engraved plastic laminate, black letters on white background for normal systems and white letters on red background for emergency systems.

B. Electronic Labels: 9mm self-adhesive tape, black letters on clear for normal systems and red letters on clear for emergency systems. Embossed DymoType labels are not accepted.

C. Wires and Cable Markers: Cloth markers, split sleeve and tubing type.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.

B. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work. Degrease and clean surfaces to receive nameplates and labels.

C. Conduit Identification: Use adhesive marking labels at 40 foot intervals to identify all conduits run exposed or located above accessible ceilings. Conduits located above non-accessible ceiling or in floors and walls shall be labeled within 3 feet of becoming accessible. Use the following colors:
   1. 600 Volt and Below: Black letters on orange background indicating feeder identification and
   2. Other Systems: Provide color banding as specified below.

D. Identify Junction, Pull, and Connection Boxes: Identification of systems and circuits shall be pressure-sensitive, self-adhesive label indicating system voltage and identity of contained circuits on outside of box cover. Color code shall be same as conduits for pressure sensitive labels. Use pressure-sensitive plastic labels at exposed locations and indelible marker (black or red) at concealed boxes. All fire alarm boxes shall have covers painted red.

E. Power Circuit Identification: Tag or label conductors as follows:
1. Multiple Circuits: Where multiple branch circuits or control wiring or communications/signal conductors are present in the same box or enclosure label each conductor or cable including neutrals. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by means of coded color of conductor insulation. For control and communications/signal wiring, use color coding or wire/cable marking tape at terminations and at intermediate locations where conductors appear in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.

2. Match identification markings with designations used in panel boards shop drawings, Contract Documents, and similar previously established identification schemes for the facility’s electrical installations.

F. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panel boards and alarm/signal components, where labeling is specified elsewhere.

G. For panel boards, provide framed, typed circuit schedules (label all spares and spaces in pencil) with explicit description and identification of items controlled by each individual breaker.

H. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

I. Provide tape labels for identification of individual receptacle and switch wall plates. Locate tape on front of plate and identify branch circuit serving the receptacle or switch.

END OF SECTION 26 05 53
SECTION 26 09 43 - NETWORK LIGHTING CONTROLS

PART 1 - GENERAL

1.1 PERFORMANCE REQUIREMENTS

A. Provide lighting control software capable of linking switch inputs to relay outputs, retrieving links, viewing relay output status, controlling relay outputs, simulating switch inputs, setting device addresses and assigning switch inputs and relay outputs modes.

B. Provide automatic time controls with automatic adjustment of dawn to dusk switching. System shall automatically adjust for leap year and daylight savings time.

C. System shall include daylight harvesting control capabilities.

D. Provide system with energy usage reporting which can be downloaded to the BAS.

E. Provide automatic notification means of reporting of problem areas

F. The vendor shall input all of the fixture wattage information into the lighting software.

G. All devices be identified in the software with a software label per the naming convention tables

H. Demonstrate the operation of the emergency lighting during generator operation and signal from the fire alarm

1.2 SUBMITTALS

A. Provide shop drawings with complete layout of all lighting control equipment including but not limited to programmable controllers, network cable, relays, switches, occupancy sensors and photocell sensors.

B. Provide one-line diagrams showing the relative placement of all equipment and interconnections to equipment supplied by other manufactures.

C. Provide complete wiring details showing connections to relays, switches, occupancy sensors, photocell sensors, etc.

D. Clearly identify lighting zones which are coordinated and interface with the BAS control zones. Coordinate with Division 23.

E. NAMING CONVENTION


2. Submit naming convention for any devices not cover in Encelium tables.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: subject to compliance with requirements, provide programmable lighting control equipment of one of the following (for each type and rating of equipment).

1. Controls: Encelium Technologies Inc,

2. Sensors: Encelium Technologies Inc,

2.2 SYSTEM REQUIREMENTS

A. Provide windows graphic user interface for programming and status of lighting control system.
B. Reports: Energy performance reports shall be printable in a printer friendly format and downloadable for use in spreadsheet applications, etc.

C. Interoperability: Control module shall be configured to connect to a BACnet-compliant network, resulting in extending control to any network-compliant devices such as occupancy switches.

D. Emergency Mode: There shall be a mode, when activated through the System, that will immediately adjust lights to full light output and retain that level until the mode is deactivated. This setting shall override all other inputs. The System shall interface with the building emergency monitoring system at a convenient point and not require multiple connections.

E. Addressing: I/O Modules shall be centrally addressable, on a per fixture basis, through the software. To simplify installation and maintenance, the System shall not require manual recording of addresses for commissioning or reconfiguration.

F. LAN Operations: System shall operate independently of building’s existing network infrastructure and shall not rely on tenant supplied PCs for operation. Network infrastructure shall only be utilized for software. Manufacturer must provide software to facilitate communications. Manufacturer shall provide connection from the PC running energy management and control software to the System communication bus.

G. Firewall Security: System firewall technology shall maintain network security.

H. Re-configurability: The assignment of individual fixtures to zones shall be centrally configurable by software such that physical rewiring will not be necessary when workspace reconfiguration is performed. Removal of covers, faceplates, ceiling tiles, etc. shall not be required.

2.3 I/O MODULE

A. General:

1. Addressing: All I/O modules shall be individually addressable via software.
2. Memory: Retains all system settings in non-volatile memory.
3. Coordinate installation of I/O modules on mechanical equipment with control contractor for zone occupancy status. Relays to be mounted on enclosure of mechanical equipment. Dry contacts wired by control contractor to mechanical equipment. Relay to be provided by electrical contractor.

2.4 WALL CONTROLLERS

A. General

1. Addressing: All wall modules shall be individually addressable via software.
2. Memory: Retains all system settings in non-volatile memory.
3. Ratings: Shall be low voltage input.

2.5 PHOTO SENSOR

A. General

1. Addressing: All photo sensors modules shall be individually addressable via software.
2. Memory: Retains all system settings in non-volatile memory.
3. A sensor that measures ambient light in a finite area shall be available.
4. Mounting: The sensor shall be flush mounted on or recessed inside ceiling tile.

2.6 OCCUPANCY SENSORS

A. General:

1. Addressing: All I/O modules shall be individually addressable via software.
2. Memory: Retains all system settings in non-volatile memory.
3. Technology: Provide dual technology sensors where the sensitivity adjustment for each technology is configured through the System software.
   Provide sensor with minimum timeout of 30 seconds.
4. Sensor timeouts shall be configurable by System software. Above the minimum sensor timeout setting.
5. Mounting: Sensors for mounting on ceilings and walls, including corners, must be available.
6. Self-learning sensors will not be allowed.

2.7 LIGHTING CONTROL PANELS

A. General

1. Addressing: All relays shall be individually addressable via software.
2. Memory: Retains all system settings in non-volatile memory.
3. Wiring: Relay control panels shall be interconnected with any other devices on the same wiring loop.
4. Provide phenolic labeling on the ceiling grid for any network communication devices, such as routers, bridges, or gateways.

2.8 EMERGENCY SHUNT DEVICES:

A. General

1. Operation: Normally-closed electrically-held relay to be wired in parallel with control switch/relay.
   a. Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below.
   b. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
2. LED Indicator Light: Indicates status of normal and emergency power.
3. All emergency lighting shall be ‘on’ upon activation of the fire alarm system.
4. Emergency lighting shall be controlled with a shunt to keep off based upon occupancy and emergency operation.
5. Relays will indicate off, on, and shunt status in the system software.

PART 3 - EXECUTION

3.1 ENCLOSED OFFICES

A. Provide occupancy sensor control in all offices with manual override controls. Configure office with manual on and auto off controls. Provide manual dimming controls.

B. Provide daylight harvesting controls for all perimeter offices by dim to minimum 10% before switching off fixture(s) when adequate daylight is detected by photocell.

C. Provide hardwired I/O module interface with BAS controls

3.2 CONFERENCE ROOMS

A. Provide multi zone controls for all conference rooms. Coordinate zones with audio/visual systems to allow for video and projection presentations, video conferencing, etc. Light fixtures closest to the projections screen or monitor shall be on a separate lighting zone form the rest of the room. Coordinate with Educational Services.

B. Provide occupancy sensor controls configured with manual on and auto off and dimming controls. Provide dimming to minimum 1%

C. Provide hardwired I/O module interface with BAS controls.
D. Provide low voltage controls to all motorized shades and projection screens.

3.3 LOBBIES AND CORRIDORS

A. Provide occupancy sensors configured for automatic on/off. Provide daylight harvesting dimming to minimum 10% before turning off fixtures where possible.

B. Coordinate occupancy time delay with university project manager.

C. Egress lighting may be controlled under certain conditions. Coordinate with the University Project Manager.

D. Provide hardwired I/O module interface with BAS controls.

3.4 EXTERIOR

A. Provide control of all parking poles, pedestrian poles, building fixtures and emergency ring down light fixtures.

B. Provide astronomical clock on/off control

C. Exterior lighting shall be zoned separately for architectural and egress areas.

D. Provide interface with A/V control panel.

PART 4 - PROJECT DOCUMENTATION

4.1 Project Record Documentation:

A. At least 3 working days before final acceptance demonstration, the contractor shall submit project record drawings of the network lighting for approval by the university. If more than three errors or omissions are found during the university review or during the acceptance procedure the acceptance procedure will be cancelled and rescheduled when accurate and complete drawings are received.

B. Project Record Documents shall include all the information in the submittal drawings plus:

C. All communication wiring shall have the exact route shown on a floor plan.

D. Include the working construction drawings set from the installation sub-contractor.

E. Exact locations of all devices including panels, communication devices, I/O devices, etc. shall be shown. Any room numbers changes during construction will be incorporated into the record documentation.

F. All changes made during installation shall be shown, update the devices to where they are actually installed.

G. The electrical circuits used by the network lighting should be clearly indicated as panel and circuit number.

H. Unit communication address identifiers shall be shown.

I. Conductor and network identifier numbers shall be shown.

J. Update the bill of material to show the installed device quantities.

K. The electric circuiting layer needs to be turned on for the drawing.

L. Update drawings and remove any notes, clouds, x’s and removed devices.

M. Include the X-ref(s) to the AutoCAD drawings.
CU Denver Building Convert Room 1110 & 1120 to CityCenter
University of Colorado Denver

N. Update the Title Block on the drawings.

O. After receiving final approval, supply six (or as specified on Division 1) complete project record drawing sets together with an electronic copy, PDF and AutoCAD, to the university. The project is not considered complete until record documents have been received and certified complete and accurate by the university.

P. O&M manuals shall be provided that detail any maintenance required for any device in the system.

PART 5 - WARRANTY

A. The lighting controls shall be warranted to be free from defects in both material and workmanship for a period of one (1) year of normal use and service. This warranty shall become effective the date the university accepts the system. The warranty shall include 24 hour per day, 7 day per week emergency problem response and all standard service contract preventative maintenance items (i.e. I/O calibration, sensor adjustment, etc.). An emergency service number shall be provided to the university. Response shall be within twenty-four (24) hours to the phone call. Provide a phone number for the factory service for 24 hour response to the owner.

B. Provide factory trained technicians familiar with the installation for emergency warranty service. An electrician will be available to support the activities of the technician, as needed.

C. Upgrades: Include all controller firmware and software updates for the installed system version at no additional cost to the system the owner during the warranty period. The controller firmware and software will be installed by a factory trained technician.

D. Tuning: Include 4 site visits by a factory trained technician for lighting system analysis for efficiency and effectiveness of energy savings. Provide operation and seasonal fine-tuning of parameters to provide an optimized control system to the university by a factory trained technicians. The visits will be to be completed at the 3rd, 6th, 9th, and 11th months of the warranty period.

E. Provide a professional service report for any of the warranty work, system analysis, and changes to parameters.

PART 6 - QUALITY ASSURANCE

A. Installation

1. All installers will have the required training from the controls manufacture on installation of the network lighting before installation of the system. If certification is available from the vendor, the installer shall complete the certification. Provide a list of trained installers to the general contractor for record keeping.

END OF SECTION 26 09 43
SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide wiring devices of one of the following:
   1. Devices:
      a. Harvey Hubbell Inc.
      b. Leviton Mfg. Co.
      c. Pass and Seymour Inc.
      d. Bryant Electric Co.
      e. General Electric Co.
   2. Wall (Local) Switches: Numbers used below are those of Hubbell. Equivalent Cooper, P & S, or Leviton.

2.2 MATERIALS, GENERAL

A. Receptacles:
   1. Duplex receptacles shall be of the heavy-duty type, NEMA 5-20 Reconfigurations. They shall be capable of being side or back wired, with clamp type terminals for back wiring. The grounding blades shall be aligned in such a manner that they are parallel to the longitudinal plane of the receptacle. Plus type receptacles are not permitted.
   2. All duplex, single, and special receptacles shall be heavy duty, standard grade listed by Underwriter’s Laboratories, and have a single brass mounting strap with self-grounding and have a hex-head green grounding screw and be side and back wired. Each device shall bear the UL/FS Label.
   3. Convenience Receptacle Configuration: NEMA WD 1; Type 5-20R.. All receptacles connected to emergency circuits shall have a red face. Color selection for normal devices shall be verified with Engineer prior to ordering.

B. Switches:
   1. Wall Switches for Lighting Circuits: NEMA WD1; FS W-S-896E; AC, quiet type, specification grade, listed by Underwriter’s Laboratories with toggle handle, rated 20 amperes or greater at 277 volts AC, unless noted otherwise. Mounting straps shall be metal and be equipped with a green hex-head ground screw. Each switch shall bear the UL/FS Label.
   2. Pilot Light Type: Lighted handle lit when switch is "on."
   3. Locator Type: Continuously lighted handle.

<table>
<thead>
<tr>
<th>Switch Type</th>
<th>Code</th>
<th>Amps</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Pole Switches</td>
<td>#1221</td>
<td>20</td>
<td>277</td>
</tr>
<tr>
<td>Three-Way Switches</td>
<td>#1223</td>
<td>20</td>
<td>277</td>
</tr>
<tr>
<td>Four-Way Switches</td>
<td>#1224</td>
<td>20</td>
<td>277</td>
</tr>
<tr>
<td>Switch with Pilot</td>
<td>Series 1200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C. Wiring Device Accessories:

1. Wall Plates: Provide Wall plates for single and combination wiring devices, of types, sizes, and with ganging and cutouts as indicated. Select plates which mate and match wiring devices to which attached. Construct with metal screws for securing plates to devices; screw heads colored to match finish of plates. Identify all wall plates used for receptacles with branch circuit number. Provide blank wall plates for all cable, data, telephone and junction and outlet boxes. Where
cables are routed through the wall plate, provide grommets in wall plate openings to protect cables. Provide plates possessing the following additional construction features:
  a. Material and Finish: Stainless steel smooth or match existing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify boxes are installed at proper height and openings are neatly cut and will be completely covered by wall plates.

B. Verify branch circuiting wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 INSTALLATION, GENERAL

A. Install wiring devices of type as indicated on drawings. All connections shall be made up tight and device set plumb. Use care in installing device in order to prevent damage to device and wire in outlet box. Install wiring devices as indicated, in accordance with manufacturer’s written instruction, applicable requirements of NEC and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate with other work, including painting, electrical boxes and wiring work, as necessary to interface installation of wiring devices with other work.

C. Install wiring devices only in electrical boxes that are clean; free from excess building materials, dirt, and debris.

D. Install wiring devices after wiring work has been installed and wall finishes have been completed. Install wall plates plumb and level, after painting work is completed. Provide a device plate for each outlet to suit device installed and install blank plates or covers for J-boxes and empty outlets.

E. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer’s published torque tightening values for wiring devices or as required per UL Standards 486A.

F. Upon installation of wall plates and receptacles, advise Contractor regarding proper and cautious use of convenience outlets. At time of Final Completion, replace those items that have been damaged, including those burned and scored by faulty plugs.

G. Provide equipment grounding connections for wiring devices, unless otherwise indicated.

3.3 TESTING, CLEANING, AND CERTIFICATION

A. Refer to Standard Section 26 05 00 for testing, cleaning, and certification requirements.

B. Prior to energizing circuitry, test wiring for electrical continuity, and for short-circuits. Ensure proper polarity of connections is maintained. Subsequent to energization, test wiring devices to demonstrate compliance with requirements.

C. Test ground fault interrupter operation with both local and remote fault simulations in accordance with manufacturer recommendations.

END OF SECTION 26 27 26
SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUBMITTALS

1.2 Product Data: Submit product data with mounting type and installation instructions for each proposed types of luminary and accessories. DELIVERY, STORAGE AND HANDLING

A. Deliver luminaries in factory-fabricated containers or wrappings, which properly protect them from damage.

B. Store luminaries in original packaging. Store inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, laid flat, and blocked off ground.

C. Handle luminaries carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged units or components; replace with new.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Wiring: Provide electrical wiring within luminary suitable for connecting to branch circuit wiring as follows:
   1. NEC Type THHN for 120 volt, minimum #18 AWG
   2. NEC Type THHN for 277 volt, minimum #18 AWG
   3. Provide a green grounding wire in flexible conduit connection to all recessed fixtures. Provide green grounding wire to all power outlets. Provide green grounding wire in all runs from panels to fixtures and devices.

B. Lenses: Diffusers for fixtures shall be acrylic A12.125.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which lighting is to be installed, and substrate for supporting lighting. Notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION, GENERAL

A. Install lighting at locations and heights as indicated, in accordance with manufacturer’s written instructions, applicable requirements of NEC, NECA’s “Standard of Installation,” NEMA standards, and with recognized industry practices to ensure that lighting fulfills requirements.

B. Provide luminaries and/or outlet boxes with hangers to properly support luminary weight. Comply with IBC luminary support requirements.

C. Install flush-mounted luminaries properly to eliminate light leakage between frame and finished surface.

D. Fasten luminaries securely to indicate structural supports; and ensure that pendant luminaries are plumb and level. Provide individually mounted pendant luminaries longer than 2 feet with twin hangers. Mount
continuous rows of luminaries with one more aircraft cable support greater than number of luminaries in the row.

E. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer’s published torque tightening values for equipment connectors. Where manufacturer’s torque requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and 486B, and the National Electrical Code (NEC).

F. Provide additional supports for all surface-mounted luminaries greater than 2 feet in length in addition to the outlet box.

G. Grounding: Provide equipment-grounding connections for lighting as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.

H. Install exit signs per manufactures recommendations.

3.3 TESTING, CLEANING, AND CERTIFICATION

A. Clean luminaries of dirt and construction debris upon completion of installation, and again prior to project turnover. Clean fingerprints and smudges from lenses.

B. Protect installed luminaries from damage during remainder of construction period.

C. At Date of Final Completion, replace lamps in luminaries that are observed to be noticeably dimmed after Contractor’s use and testing, as judged by Engineer.
   1. Refer to Division 1 sections for the replacement/restoration of lamps in lighting where used for temporary lighting prior to Date of Final Completion.

END OF SECTION 26 51 00
PART 1 - GENERAL

1.1 PROJECT DESCRIPTION

A. The existing Silent Knight fire alarm panel will be modified and reprogrammed for this remodel.

1.2 PERFORMANCE REQUIREMENTS

A. Color code and minimum wire sizes for the fire alarm system as follows:
   1. All wire is solid copper:
   2. All insulation colors shall be continuous for the full length of the wire.
   3. Wire Jackets shall be stamped with the “Circuit Type” designation or shall have an affixed label designating the “Circuit Type” every twenty lineal feet at a minimum.

<table>
<thead>
<tr>
<th>Circuit Type</th>
<th>Wire</th>
<th>Colors # Of Conductors</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiating Circuits</td>
<td>(+) Red</td>
<td>2</td>
<td>18 (THHN)</td>
</tr>
<tr>
<td></td>
<td>(-) Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signaling Circuits</td>
<td>(+) Red</td>
<td>2</td>
<td>16 Twisted</td>
</tr>
<tr>
<td></td>
<td>(-) White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speaker Circuits</td>
<td>(+) Orange</td>
<td>2</td>
<td>14 Twisted</td>
</tr>
<tr>
<td></td>
<td>(-) Brown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strobe Circuits</td>
<td>(+) Yellow</td>
<td>2</td>
<td>14 Twisted</td>
</tr>
<tr>
<td></td>
<td>(-) Blue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24VDC Power Circuit</td>
<td>(+) White</td>
<td>2</td>
<td>14 THHN</td>
</tr>
<tr>
<td></td>
<td>(-) Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire Alarm Remote Light Circuit</td>
<td>(+) Red</td>
<td>2</td>
<td>18 THHN</td>
</tr>
<tr>
<td></td>
<td>(-) Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speaker Phone Cut Out Circuit</td>
<td>(+) Orange</td>
<td>2</td>
<td>14 Twisted</td>
</tr>
<tr>
<td></td>
<td>(-) Brown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Level Audio Riser Circuit</td>
<td>(+) Red</td>
<td>2</td>
<td>14 Twisted/ Shielded</td>
</tr>
<tr>
<td></td>
<td>(-) Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Level Audio Riser Circuit</td>
<td>(+) Red</td>
<td>2</td>
<td>14 Twisted</td>
</tr>
<tr>
<td></td>
<td>(-) Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door Holder Circuit</td>
<td>(+) Red</td>
<td>2</td>
<td>14 Twisted</td>
</tr>
<tr>
<td></td>
<td>(-) Black</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.3 SUBMITTAL

A. Provide shop drawings as follows:
   1. Floor plans with device layout, address and wiring.
   2. FACP layout.
   3. Riser diagrams.
   4. Battery calculation.
   5. Sequence of operation
   6. Equipment cut sheets
   7. FAAP layout.

B. CADD generated layouts for FACT screen graphics.
C. Project Record Documents:
   1. Prior to submittal of the as-built documents, submit a complete package of shop drawings to the university Facilities Operations Fire and Safety office for review. Drawings shall include floor plans and graphic maps for each building and/or floors.
   2. Submit record documents in accordance with the requirements of Section 01 78 39 and the following:
      a. As-built point-to-point wiring diagrams depicting every device, including correct university room numbers.
      b. Revised schematic, wiring, and interconnection diagrams of all circuits, internal and external, for all equipment installed and exact locations for all devices. These schematics shall include the conductor color-coding and terminal number identification system, location of all terminal boxes complete with numbering and each device address.
      c. Complete, as-installed, riser diagrams indicating the wiring sequence of all alarm initiating devices, supervisory devices, and all signaling appliances on all signaling circuits.
      d. A complete description of the system operation, including a schedule of relay abbreviations used on the drawings, list of relay functions, and the sequence of relay operation during supervisory trouble and alarm conditions.
      e. Complete wiring and control diagrams for control and shutdown circuits for fan systems.

1.4 QUALITY ASSURANCE
   A. Installer: Company with certified personnel specializing in smoke detection and fire alarm systems with five years' documented experience as a fire alarm installing contractor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Silent Knight.

2.2 APPROVED INSTALLERS
   A. Metroplex Control System (MCS) – 6950 South Tucson Way, Unit D, Centennial, CO 80112, (720) 875-0303.
   B. Advanced Electronic System – 801 Main Street, Windsor, CO 80550, (970) 686-6200
   C. FAS (Fire Alarm Services) – 4800 W 60th Ave, Arvada CO, 80003 (303) 466-8800
   D. Meridian Fire and Security – 7173 S. Havana St Ste 400 Centennial CO, 80112 (303) 790-2520
   E. Other installers will be considered if they have successfully completed 3 similar projects (in size and complexity) in the past 5 years in the Denver Metro area. The installer must have a demonstrated ability to provide ongoing service to any system it installs. Alternate installers must be approved in writing by the University Project Manager through Facilities Operations 5 working day prior to Bidding on the project. Installers should be NICET certified.

2.3 MATERIALS, GENERAL
   A. All equipment and materials used shall be standard components, regularly manufactured, and regularly utilized in the manufacturer's system.
   B. All systems and components shall have been thoroughly tested and proven in actual use.
   C. All equipment shall be listed and labeled by Underwriters Laboratories.
D. Where equipment of different manufacturers is used, such equipment shall be included under the required over-all UL system listing as a component of the integrated fire alarm system.

E. Fire Alarm System Devices:
   1. General:
      a. Each device shall be assigned a unique address. Address selection by jumpers is not acceptable. Devices which take their address from their position in the circuit are unacceptable. It is preferred that the address of the intelligent device be part of the device base rather than the device itself.
      b. Devices shall receive power and communication from the same pair of wires. For fault-tolerant circuits, any separate power wiring shall also be made fault-tolerant.

F. Other Devices:
   1. Strobes:
      a. Strobes shall be synchronized.

PART 3 - EXECUTION

3.1 INSTALLATION – FIRE ALARM

A. Low Voltage/Wire and Cable: All LV/W&C shall be run in conduit in floors, walls and non accessible spaces. In hallways, wiring shall comply with Division 27 and approved NEC.

B. Outlet pull and junction boxes shall be painted red on the exterior.

C. In construction areas where there is existing equipment, the equipment must be protected during construction and the devices taken off line to eliminate false alarms. All devices associated with modifications to an existing system must match existing devices.

D. Contractor is liable for damage. The university must be notified at the completion of each project to ensure that the system is returned to normal.

E. Labeling:
   1. Observe the university fire alarm color code guide.
   2. Label each splice with correct information.
   3. Label each initiating device with correct device address. Use Kroy labeler or equal.
   4. Final, correct university room numbers (not design/construction room numbers) must be provided for correct programming.
   5. All shielded wiring to be bonded together at each device and insulated from contact with the conduit or box.
   6. All equipment and associated wiring removed from service will be returned to the University Project Manager for proper disposal.

F. Construction Requirements:
   1. Integrity of Structure: Do not drill or pierce structural members without prior approval from the University Project Manager and Structural Engineer.
   2. Penetration of Walls, Etc.: Fire caulks or seal all penetrations made through walls, floors, and ceilings around the conduit. Maintain the integrity of fire ratings within the structure. Where visible, paint to match surface.
   3. Wherever possible, install conduits and raceways in a concealed manner, except at surface-mounted cabinets.
   4. Access to Existing Facilities: Install all conduit and pull boxes to maintain or provide access to existing valves; covers to existing pull boxes; wire ways or access doors; electrical outlets; switches; motors, etc.
5. Support bridle rings/"J" Hooks independently from structure, may have separate point of attachment to cable tray.
6. No other wiring or systems to be installed with fire alarm.

G. Prior to start of construction, disable existing fire alarm devices, as necessary. A minimum of two working days notice, prior to construction, shall be coordinated through the University Project Manager.

3.2 TESTING, CLEANING AND CERTIFICATION

A. When installation is complete, system shall be tested in accordance with NFPA72 requirements. A representative of the system manufacturer shall submit a written report of the findings to the A/E with copy of to the FD. System testing shall include, at the least, verifying the following:
   1. All installed or modified fire alarm systems for remodels or new projects shall be tested and certified by a Factory Representative. Upon a system test completion a “Letter of Certification” shall be issued to the university.

B. All testing and verifications shall be conducted in the presence of the university Facilities Operations Fire and Safety personnel.

C. There shall be an operational test by the FD.

END OF SECTION 28 31 00