Request for Documented Quote
(Construction Purchase Order under $100K)

Project #: 18-116156
Project Name: B500 1st Reno Rm C1011

Documented Quote Due by (Date/Time): 1/3/18 – 2:00 p.m.

Project Manager: David Wegener
Email Address: david.wegener@ucdenver.edu
Documented Quote Table of Contents
(Construction Purchase Order under $100K)

1. Advertisement for Documented Quote

2. Information to Bidders (SBP-6.12)
   NOTE: Electronic versions of all State Buildings (SBP and SC) forms can be found at
   https://www.colorado.gov/pacific/osa/formsproc

3. Bid Form (SBP-6.13)

4. Bid Alternates Form (SBP-6.131)

5. Bid Bond (SBP-6.14) Not Included – Please Note: if the submitted Documented Quote is
   $50,000 or higher a Bid Bond is required

6. University of Colorado Denver Facilities Management Construction Purchase Order
   Terms and Conditions

7. Insurance Requirements (A), Construction Purchase Order Insurance Requirements
   University of Colorado Denver

8. As Applicable:
   University of Colorado Denver Supplemental Checklist for Projects Under 150K

9. Scope of Work
   Description/Specifications
   Plans/Other Supporting Documentation

Appendix A: University of Colorado Denver Tax Information
DOCUMENTED QUOTE – 25K-100K – PO

Agency: University of Colorado Denver

Notice Type: Documented Quote

Construction Cost Categories: Under $100K

Should this notice include print media information: No

Project No: 18-116156

Project Title: B500 1st Reno Rm C1011 – SCPP Pre-Qualified Contractors Only

Project Description: Renovation of the suite Q20-C1011.

Project should be substantially completed within: 60 Calendar Days

Project shall be finally compete within: 15 Calendar Days

Anticipated Construction Start Date: 1/22/18

Bidder may procure Bidding Documents from:
   http://www.ucdenver.edu/about/departments/FacilitiesManagement/FacilitiesProjects/RFP/Pages/RFP.aspx
   or
   Facilities Projects, 1945 N. Wheeling St., Room 310, Aurora, CO 80045, Phone 303-724-0623

Deposit required for a complete set of Contract Documents: $0

ARRA Funding: No

Settlement Notices:

For all projects with a total dollar value above $150,000 Notice of Final Settlement is required by C.R.S. 38-26-107. Final Settlement, if required, will be advertised via: Electronic Media

Scope of Services:

General Contractor Services, including drywall, glazing, patch & paint, lighting, and electrical

Submission Details:

Submission Deadline: 1/3/18, 2:00 p.m.

Submissions Accepted Via: ☒ Email ☐ Fax ☐ In Person ☐ Mail

Details: Submit all documented quotes to David Wegener via email at david.wegener@ucdenver.edu

Comments: Documented Quotes will be received from pre-qualified SCPP contractors only. Late bids will be disregarded. When noted that a completely executed form will be sent by certified mail to the Contractor, or any other means as agreed to, notice will be sent by electronic mail.

Point of Contact:

Name: David Wegener

Agency: University of Colorado Denver

Phone: 303-724-1245

Rev. 03/2013
Meetings:

Mandatory Pre-Bid

Date and Time: 12/18/17 at 2:00 p.m.

Details: Building 500 Room Q20-C1011, 13001 East 17th Place, Aurora, CO, 80045

Comments: Bids received from bidders who have not attended the mandatory pre-bid meeting will not be considered for the project. Questions will be collected until 12/22/17 at 2:00 p.m. from those who attended mandatory pre-bid meeting. Questions will be answered by 12/27/17 at 2:00 p.m.

Specification Details/Attachments:

Attachments: Construction Documents & Specifications

Media of Publications:

Media of Publication(s):

http://www.ucdenver.edu/about/departments/FacilitiesManagement/FacilitiesProjects/RFP/Pages/RFP.aspx

Publication Dates: 12/13/17
INFORMATION FOR BIDDERS

Institution or Agency: University of Colorado Denver / GFE
Project No./Name: 18-116156 / B500 1st Reno Rm C1011

1. **BID FORM:** Bidders are required to use the Bid form attached to the bidding documents. Each bidder is required to bid on all alternates and indicate the time from the date of the Notice to Proceed to Substantial Completion in calendar days, and in addition, the bidder is required to indicate the period of time to finally complete the project from Substantial Completion to Final Acceptance, also in calendar days. Bids indicating times for Substantial Completion and Final Acceptance in excess of the number of days indicated in the Advertisement for Bids for completion of the entire Project may be found non-responsive and may be rejected. The bid shall not be modified or conditioned in any manner. Bids shall be submitted in sealed envelopes bearing the address and information shown below. If a bid is submitted by mail, this aforementioned sealed envelope should be enclosed in an outer envelope and sent to the following addressee:

**INSERT NAME OF AGENCY AND ADDRESS WHERE BID SHOULD BE DELIVERED**

The outside of the sealed inner envelope should bear the following information:

- Project #
- Project Name
- Name and Address of Bidder
- Date of Opening
- Time of Opening

2. **INCONSISTENCIES AND OMISSIONS:** Bidders may request clarification of any seeming inconsistencies, or matters seeming to require explanation, in the bidding documents at least three (3) business days prior to the time set for the opening of Bids. Decisions of major importance on such matters will be issued in the form of addendum.

3. **APPLICABLE LAWS AND REGULATIONS:** The bidder’s attention is called to the fact that all work under this Contract shall comply with the provisions of all state and local laws, approved state building codes, ordinances and regulations which might in any manner affect the work to be done or those to be employed in or about the work. Attention is also called to the fact that the use of labor for work shall be governed by the provisions of Colorado law which are hereinafter set forth in Articles 27 and 52E of the GENERAL CONDITIONS.

4. **UNAUTHORIZED IMMIGRANTS:** Note that the Special Provisions of the General Conditions of the Contract includes the following language: PUBLIC CONTRACTS FOR SERVICES - CRS 8-17.5-101 and PUBLIC CONTRACTS WITH NATURAL PERSONS - 24-76.5-101. The Contractor certifies that the Contractor shall comply with the provisions of CRS 8-17.5-101 et seq. The Contractor shall not knowingly employ or contract with an illegal alien to perform work under this contract or enter into a contract with a subcontractor that fails to certify to the Contractor that the subcontractor shall not knowingly employ or contract with an illegal alien to perform work under this contract. The Contractor represents, warrants, and agrees that it (i) has verified that it does not employ any illegal aliens, through participation in the Basic Pilot Employment Verification Program administered by the Social Security Administration and Department of Homeland Security, and (ii) otherwise will comply with the requirements of CRS 8-17.5-102(2)(b). The Contractor shall comply with all reasonable requests made in the course of an investigation under CRS 8-17.5-102 by the Colorado Department of Labor and Employment. If the Contractor fails to comply with any requirement of this provision or CRS 8-17.5-101 et seq., the State may terminate this contract for breach and the Contractor shall be liable for actual and consequential damages to the State.

A Contractor that operates as a sole proprietor hereby swears or affirms under penalty of perjury that the Contractor (i) is a citizen of the United States or otherwise lawfully present in the United States pursuant to federal law, (ii) shall comply with the provisions of CRS 24-76.5-101 et seq, and (iii) shall produce one of the forms of identification required by CRS 24-76.5-103 prior to the effective date of this Contract. Except where
exempted by federal law and except as provided in CRS 24-76.5-103(3), a Contractor that receives federal or state funds under this contract must confirm that any individual natural person eighteen years of age or older is lawfully present in the United States pursuant to CRS 24-76.5-103(4) if such individual applies for public benefits provided under this contract.

5. **TAXES:** The bidder’s attention is called to the fact that the Bid submitted shall exclude all applicable federal excise or manufacturers’ taxes and all state sales and use taxes as hereinafter set forth in Article 9C of the GENERAL CONDITIONS.

6. **OR EQUAL:** The words “OR EQUAL” are applicable to all specifications and drawings relating to materials or equipment specified. Any material or equipment that will fully perform the duties specified, will be considered “equal”, provided the bid submits proof that such material or equipment is of equivalent substance and function and is approved, in writing. Requests for the approval of “or equal” shall be made in writing at least five (5) business days prior to bid opening. During the bidding period, all approvals shall be issued by the Architect/Engineer in the form of addenda at least two (2) business days prior to the bid opening date.

7. **ADDENDA:** Owner/architect initiated addenda shall not be issued later than two (2) business days prior to bid opening date. All addenda shall become part of the Contract Documents and receipt must be acknowledged on the Bid form.

8. **METHOD OF AWARD - LOWEST RESPONSIBLE BIDDER:** If the bidding documents for this project require alternate prices, additive and/or deductible alternates shall be listed on the alternates bid form provided by the Principal Representative. Bidders should note the Method of Award is applicable to this Bid as stated below.

   A. **DEDUCTIBLE ALTERNATES:** The lowest responsible Bid, taking into account the Colorado resident bidder preference provision of Colorado law, will be determined by and the contract will be awarded on the base bid combined with deductible alternates, deducted in numerical order in which they are listed in the alternates bid form provided by the Principal Representative. The subtraction of alternates shall result in a sum total within available funds. If this bid exceeds such amount, the right is reserved to reject all bids. An equal number of alternates shall be subtracted from the base bid of each bidder within funds available for purposes of determining the lowest responsible bidder.

   B. **ADDITIVE ALTERNATES:** The lowest responsible Bid, taking into account the Colorado resident bidder preference provision of Colorado law, will be determined by and the contract will be awarded on the base bid plus all additive alternates added in the numerical order in which they are listed in the alternates bid form provided by the Principal Representative. The addition of alternates shall result in a sum total within available funds. If this bid exceeds such amount, the right is reserved to reject all bids. An equal number of alternates shall be added to the base bid of each bidder within funds available for purposes of determining the lowest responsible bidder.

   C. **DEDUCTIBLE AND ADDITIVE ALTERNATES:** Additive alternates will not be used if deductible alternates are used and additive alternates will not be used if additive alternates are used.

9. **NOTICE OF CONTRACTOR’S SETTLEMENT** – Agencies/institutions must indicate in the initial Solicitation (Advertisement for Bids, Documented Quotes, or Requests for Proposals) whether settlement will be advertised in newspapers or electronic media.

The Advertisement for Bids can be located at the web site: [www.colorado.gov/pacific/osa/cdnotices](http://www.colorado.gov/pacific/osa/cdnotices) (Click on the appropriate link [ColoradoVSS or ColoradoBIDS] or on the State Purchasing Office website)
STATE OF COLORADO
OFFICE OF THE STATE ARCHITECT
STATE BUILDINGS PROGRAMS

BID

Institution/Agency: University of Colorado Denver / GFE

Project No./Name: 18-116156 / B500 1st Reno Rm C1011

Bidder Acknowledges Receipt of Addenda Numbers:

Bidder Anticipates Services outside the United States or Colorado:  
No [ ] Yes [ ] If Yes see 3A below

Bidder will comply with 80% Colorado Labor on project above $500,000:  
Yes [ ] No [ ] If No see 3B below

Bidder is a Service-Disabled Veteran Owned Small Business:  
No [ ] Yes [ ] If Yes see 3C below

Base Bid

(Refer to Bid Alternate Form SC-6.13.1 Attached, If Applicable)

Bidder’s Time of Completion

a. Time Period from Notice to Proceed to Substantial Completion: 60 days

b. Time Period from Substantial Completion to Final Acceptance: 15 days

c. Total Time of Completion of Entire Project (a + b): 75 days

1. BID: Pursuant to the advertisement by the State of Colorado dated _______ the undersigned bidder hereby proposes to furnish all the labor and materials and to perform all the work required for the complete and prompt execution of everything described or shown in or reasonably implied from the Bidding Documents, including the Drawings and Specifications, for the work and for the base bid indicated above. Bidders should include all taxes that are applicable.

2. EXAMINATION OF DOCUMENTS AND SITE: The bidder has carefully examined the Bidding Documents, including the Drawings and Specifications, and has examined the site of the Work, so as to make certain of the conditions at the site and to gain a clear understanding of the work to be done.

3. PARTIES INTERESTED IN BID: The bidder hereby certifies that the only persons or parties interested in this Bid are those named herein, and that no other bidder or prospective bidder has given any information concerning this Bid.

A. If the bidder anticipates services under the contract or any subcontracts will be performed outside the United States or Colorado, the bidder shall provide in a written statement which must include, but need not be limited to the type of services that will be performed at a location outside the United States or Colorado and the reason why it is necessary or advantageous to go outside the United States or Colorado to perform such services. (Does not apply to any project that receives federal moneys)

B. For State Public Works projects per C.R.S. 8-17-101, Colorado labor shall be employed to perform at least 80% of the work. Colorado Labor means any person who is a resident of the state of Colorado at the time of the Public Works project. Bidders indicating that their bid proposal will not comply with the 80% Colorado Labor requirement are required to submit written justification along with the bid submission. (Does not apply to any project that receives federal moneys)

C. A Service-Disabled Veteran Owned Small Business (SDVOSB) per C.R.S. 24-103-211, means a business that is incorporated or organized in Colorado or maintains a place of business or has an office in Colorado and is officially registered and verified by the Center for Veteran Enterprise within the U.S. Department of Veteran Affairs. Attach proof of certification along with the bid submission.

4. BID GUARANTEE: This Bid is accompanied by the required Bid Guarantee. You are authorized to hold said Bid Guarantee for a period of not more than thirty (30) days after the opening of the Bids for the work above indicated, unless the undersigned bidder is awarded the Contract, within said period, in which event the Director, State Buildings Programs, may retain said Bid Guarantee, until the undersigned bidder has executed the required Agreement and furnished the required Performance Bond, Labor and Material Payment Bond, Insurance Policy and Certificates of Insurance and Affidavit Regarding Unauthorized Immigrants.

5. TIME OF COMPLETION: The bidder agrees to achieve Substantial Completion of the Project from the date of the Notice to Proceed within the number of calendar days entered above, and in addition, further agrees that the period between Substantial Completion and Final Acceptance of the Project will not exceed the number of calendar days noted above. If awarded the Work, the bidder agrees to begin performance within ten (10) days from

State Form SBP-6.13
Rev.7/2015
the date of the Notice to Proceed subject to Article 46, Time of Completion and Liquidated Damages of The General Conditions of the Contract, and agrees to prosecute the Work with due diligence to completion. The bidder represents that Article 7D of the Contractor’s Agreement (SC-6.21) has been reviewed to determine the type and amount of any liquidated damages that may be specified for this contract.

6. EXECUTION OF DOCUMENTS: The bidder understands that if this Bid is accepted, bidder must execute the required Agreement and furnish the required Performance Bond, Labor and Material Payment Bond, Insurance Policy and Certificates of Insurance and Affidavit Regarding Unauthorized Immigrants within ten (10) days from the date of the Notice of Award, and that the bidder will be required to sign to acknowledge and accept the Contract Documents, including the Drawings and Specifications.

7. ALTERNATES: Refer to the Information for Bidders (SC-6.12) for Method of Award for Alternates and use State Form SBP-6.13.1 Bid Alternates form to be submitted with this bid form if alternates are requested by the institution/agency in the solicitation documents.

8. Submit wage rates (direct labor costs) for prime contractor and subcontractor as requested by the institution/agency in the solicitation documents.

9. The right is reserved to waive informalities and to reject any and all Bids.

SIGNATURES: If the Bid is being submitted by a Corporation, the Bid shall be signed by an officer, i.e., President or Vice-President. If a sole proprietorship or a partnership is submitting the Bid, the Bid shall so indicate and be properly signed.

Dated this _______ Day of ______________ , 20___

THE BIDDER:

Company Name

Address (including city, state and zip)

Phone number:

Name (Print) and Title

Signature
Additive alternates will not be used if deductible alternates are used and deductible alternates will not be used if additive alternates are used.

Additive Alternates (If Applicable)
Refer to specification section 01 23 00 for descriptions of add alternates. If the add alternates are accepted, the base bid would be modified by the amount entered by the bidder.

A.A. No. 1  Lighted Feature Wall  Add $
A.A. No. 2  New Ceiling Tile  Add $
A.A. No. 3  Wood Wall Base  Add $
A.A. No. 4  Add $
A.A. No. 5  Add $
A.A. No. 6  Add $
A.A. No. 7  Add $
A.A. No. 8  Add $
A.A. No. 9  Add $
A.A. No. 10  Add $

Deductive Alternates (If Applicable)
Refer to specification section _________ for descriptions of the deductive alternates. If the deductive alternates are accepted, the base bid would be modified by the amount entered by the bidder.

D.A. No. 1  Deduct $
D.A. No. 2  Deduct $
D.A. No. 3  Deduct $
D.A. No. 4  Deduct $
D.A. No. 5  Deduct $
D.A. No. 6  Deduct $
D.A. No. 7  Deduct $
D.A. No. 8  Deduct $
D.A. No. 9  Deduct $
D.A. No. 10  Deduct $

THE BIDDER:

Company Name

Signature  Date
Facilities Management
Construction Purchase Order Terms and Conditions

1. Offer/Acceptance

If this purchase order ("PO") refers to vendor's bid or proposal, this PO is an ACCEPTANCE of vendor's OFFER TO SELL in accordance with the terms and conditions of the "solicitation" identified in vendor's bid or proposal. The solicitation includes an RFP, IFB, or any other form of order by the University. If a bid or proposal is not referenced, this PO is an OFFER TO BUY, subject to vendor's acceptance, demonstrated by vendor's performance or written acceptance of this PO. Any COUNTER-OFFER TO SELL automatically CANCELS this PO, unless a change order is issued by the University accepting a counter-offer. This PO shall supersede and control over any vendor form(s) or part(s) thereof included in or attached to any bid, proposal, offer, acknowledgment, or otherwise, in the event of inconsistencies or contradictions, regardless of any statement to the contrary in such form(s) or parts thereof.

2. Safety Information

All chemicals, equipment and materials proposed and/or used in the performance of this PO shall conform to the requirements of the Occupational Safety and Health Act of 1970. Vendor shall furnish all Material Safety Data Sheets (MSDS) for any regulated chemicals, equipment or hazardous materials at the time of delivery.

3. Changes

Vendor shall furnish products and/or services strictly in accordance with the specifications and price set forth for each item. This PO shall not be modified, superseded or otherwise altered, except in writing signed by purchasing agent and accepted by vendor. Each shipment received or service performed shall comply with the terms of this PO, notwithstanding invoice terms or acts of vendor to the contrary, unless this PO has been modified, superseded or otherwise altered in accordance with this section.

4. Delivery

Unless otherwise specified in the solicitation or this PO, delivery shall be FOB destination. The University is relying on the promised delivery date, installation, and/or service performance set forth in vendor's bid or proposal as material and basic to the University's acceptance. If vendor fails to deliver or perform as and when promised, the University in its sole discretion, may cancel its order, or any part thereof, without prejudice to its other rights, return all or part of any shipment so made, and charge vendor with any loss or expense sustained as a result of such failure to deliver or perform as promised. Time is of the essence.

5. Intellectual Property

Any software, research, reports, studies, data, photographs, negatives or other documents, drawings or materials (collectively "materials") delivered by vendor in performance of its obligations under this PO shall be the exclusive property of the University. Ownership rights shall include, but not be limited to, the right to copy, publish, display, transfer, prepare derivative works, or otherwise use the materials. Vendor shall comply with all applicable laws, regulations and University policies related to confidential information and all confidentiality and non-disclosure agreements, security controls, and reporting requirements.

6. Quality
The University shall be the sole judge in determining "equals" with regard to quality, price and performance. All products delivered shall be newly manufactured and the current model, unless otherwise specified.

7. Warranties

All provisions and remedies of the Colorado Uniform Commercial Code, CRS, Title 4 ("CUCC"), relating to implied and/or express warranties are incorporated herein, in addition to any warranties contained in this PO or the specifications.

8. Inspections and Acceptance

Final acceptance is contingent upon completion of all applicable inspection procedures. If products or services fail to meet any inspection requirements, the University may exercise all of its rights, including those provided in the CUCC. The University shall have the right to inspect services provided under this PO at all reasonable times and places. "Services" as used in this section includes services performed or tangible material produced or delivered in the performance of services. If any of the services do not conform to PO requirements, the University may require vendor to perform the services again in conformity with PO requirements, without additional payment. When defects in the quality or quantity of service cannot be corrected by re-performance, the University may (a) require vendor to take necessary action to ensure that future performance conforms to PO requirements and (b) equitably reduce the payment due vendor to reflect the reduced value of the services performed. These remedies do not limit the remedies otherwise available in this PO, at law, or in equity.

9. Cash Discount

The cash discount period will start from the later of the date of receipt of acceptable invoice, or from date of receipt of acceptable products/services at the specified destination by an authorized University representative.

10. Taxes

The University is exempt from all federal excise taxes under Chapter 32 of the Internal Revenue Code and from all State and local government sales and use taxes [CRS, Title 39, Article 26, Parts I and II].

11. Payment

The University shall pay vendor for all amounts due within 30 days after receipt of products or services and a correct notice of amount due. Interest on the unpaid balance shall begin to accrue on the 46th day at the applicable statutory rate. Interest shall not accrue if a good faith dispute exists as to the University's obligation to pay all or a portion of the amount due. Vendor shall invoice the University separately for interest on delinquent amounts due, referencing the delinquent payment, number of day's interest to be paid, and applicable interest rate.

12. Vendor Offset

[Not Applicable to Inter-governmental POs] The University may withhold payment as required under the State vendor offset intercept system for debts owed for: (a) unpaid child support debts or arrearages; (b) unpaid balances of tax, accrued interest, or other charges specified in CRS § 39-21-101, et seq.; (c) unpaid loans due to the Student Loan Division of the Department of Higher Education; (d) amounts required to be paid to the Unemployment Compensation Fund; and (e) other unpaid debts owing to the University.

13. Assignment and Successors
Vendor shall not assign rights or delegate duties under this PO, or subcontract any part of the performance required under this PO, without the express, written consent of the University. This PO shall inure to the benefit of and be binding upon vendor and the University and their respective successors and assigns. Assignment of accounts receivable may be made only upon written notice furnished to the University.

14. Indemnification

If any article sold or delivered under this PO is covered by a patent, copyright, trademark, or application therefore, vendor shall indemnify and hold harmless the University from any and all loss, liability, cost, expenses and legal fees incurred on account of any claims, legal actions or judgments arising out of manufacture, sale or use of such article in violation or infringement of rights under such patent, copyright, trademark or application. If this PO is for services, vendor shall indemnify, save, and hold harmless the University, its employees and agents, against any and all claims, damages, liability and court awards including costs, expenses, and attorney fees and related expenses, incurred as a result of any act or omission by vendor, or its employees, agents, subcontractors or assignees, arising out of or in connection with performance of services under this PO.

15. Independent Contractor

Vendor shall perform its duties hereunder as an independent contractor and not as an employee. Neither vendor nor any agent or employee of vendor shall be deemed to be an agent or employee of the University. Vendor and its employees and agents are not entitled to unemployment insurance or workers compensation benefits through the University and the University shall not pay for or otherwise provide such coverage for vendor or any of its agents or employees. Unemployment insurance benefits will be available to vendor and its employees and agents only if coverage is made available by vendor or a third party. Vendor shall pay when due all applicable employment, income, and local head taxes incurred pursuant to this PO. Vendor shall not have authorization, express or implied, to bind the University to any agreement, liability or understanding. Vendor shall (a) provide and keep in force workers’ compensation and unemployment compensation insurance in the amounts required by law, (b) provide proof thereof when requested by the University, and (c) be solely responsible for its acts and those of its employees and agents.

16. Communication

All communication concerning administration of this PO, prepared by vendor for the University's use, shall be furnished solely to purchasing agent.

17. Compliance

Vendor shall strictly comply with all applicable federal and state laws, rules, and regulations in effect or hereafter established, including, without limitation, laws applicable to discrimination and unfair employment practices.

18. Insurance

Vendor shall obtain, and maintain, at all times during the term of this PO, insurance as specified in the solicitation, and provide proof of such coverage as requested by the University's purchasing agent.

19. Termination Prior to Shipment

If vendor has not accepted this PO in writing, the University may cancel this PO by written or oral notice to vendor prior to shipment of goods or commencement of services.
20. Termination for Cause

(a) If vendor refuses or fails to timely and properly perform any of its obligations under this PO with such diligence as will ensure its completion within the time specified herein, the University may notify vendor in writing of non-performance and, if not corrected by vendor within the time specified in the notice, terminate vendor’s right to proceed with the PO or such part thereof as to which there has been delay or a failure. Vendor shall continue performance of this PO to the extent not terminated and be liable for excess costs incurred by the University in procuring similar goods or services elsewhere. Payment for completed services performed and accepted shall be at the price set forth in this PO. (b) The University may withhold amounts due to vendor as the University deems necessary to reimburse the University for excess costs incurred in curing, completing or procuring similar goods and services. (c) If after rejection, revocation, or other termination of vendor’s right to proceed under the CUCC or this clause, the University determines for any reason that vendor was not in default or the delay was excusable, the rights and obligations of the University and vendor shall be the same as if the notice of termination had been issued pursuant to termination under § 21.

21. Termination in Public Interest

The University is entering into this PO for the purpose of carrying out the public policy of the State and University, as determined by the Governor, General Assembly and Courts of the State of Colorado and the University of Colorado Board of Regents. If this PO ceases to further the public policy of the State or University, the University, in its sole discretion, may terminate this PO in whole or in part and such termination shall not be deemed to be a breach of the University’s obligations hereunder. This section shall not apply to a termination for vendor’s breach, which shall be governed by Item 20 (Termination for Cause). The University shall give written notice of termination to vendor specifying the part of the PO terminated and when termination becomes effective. Upon receipt of notice of termination, vendor shall not incur further obligations except as necessary to mitigate costs of performance. For services or specially manufactured goods, the University shall pay (a) reasonable settlement expenses, (b) the PO price or rate for supplies and services delivered and accepted, (c) reasonable costs of performance on unaccepted supplies and services, and (d) a reasonable profit for the unaccepted work. For existing goods, the University shall pay (e) reasonable settlement expenses, (f) the PO price for goods delivered and accepted, (g) reasonable costs incurred in preparation for delivery of the undelivered goods, and (h) a reasonable profit for the preparatory work. The University’s termination liability under this section shall not exceed the total PO price plus a reasonable cost for settlement expenses. Vendor shall submit a termination proposal and reasonable supporting documentation, and cost and pricing data as required by CRS § 24-106-101, upon request of the University.

22. PO Approval

This PO shall not be valid unless it is executed by purchasing agent. The University shall not be responsible or liable for products or services delivered or performed prior to proper execution hereof.

23. Fund Availability

Financial obligations of the University payable after the current fiscal year are contingent upon funds for that purpose being budgeted and otherwise made available. If this PO is funded in whole or in part with federal funds, this PO is subject to and contingent upon the continuing availability of federal funds for the purposes hereof. The University represents that it has set aside sufficient funds to make payment for goods delivered in a single installment, in accordance with the terms of this PO.

24. Choice of Law

Colorado laws, rules and regulations shall be applied in the interpretation, execution, and enforcement of this PO. The CUCC shall govern this PO in the case of goods unless otherwise agreed in this PO. Any provision included or incorporated herein by reference which conflicts with such laws, rules, and
regulations is null and void. Any provision incorporated herein by reference which purports to negate this or any other provision in this PO in whole or in part shall not be valid or enforceable or available in any action at law, whether by way of complaint, defense, or otherwise. Unless otherwise specified in the solicitation or this PO, venue for any judicial or administrative action arising out of or in connection with this PO shall be in Denver, Colorado. Vendor shall exhaust administrative remedies in CRS § 24-109-106, prior to commencing any judicial action against the University.

25. Sensitive Data

To the extent vendors comes in contact with individual personal data owned or otherwise held by the University including employee, student, or medical information or records as a result of performing under this PO (“Data”), vendor agrees to use such Data, if at all, only to the extent required to perform its obligations under this PO, and to abide by the requirements of any federal, state and local laws that address the protection and/or use of such Data.

26. Background Checks

Contractor acknowledges that Contractor’s activities may involve heightened risks as a result of access or exposure by Contractor's employees or agents to one or more Sensitive Environments. Contractor expressly acknowledges that Contractor shall take all commercially reasonable measures to mitigate any such risks, which measures may include but are not limited to conducting criminal history checks, financial background checks, or reference checks on employees or agents who will have access to one or more Sensitive Environments. For purposes of this provision, Sensitive Environment means any situation where Contractor's employees or agents: (a) are engaged in supervision of or exposure to minors or other vulnerable populations; (b) have access to confidential information, which includes any information protected or restricted by law or University policy or that is expressly identified by the University as confidential information; (c) have access to the University's information technology systems; (d) are engaged in activities that involve unique or specialized risks.

27. Public Contracts for Service

[Not Applicable to offer, issuance, or sale of securities, investment advisory services, fund management services, sponsored projects, intergovernmental POs, or information technology services or products and services] Vendor certifies, warrants, and agrees that it does not knowingly employ or contract with an illegal alien who will perform work under this PO and will confirm the employment eligibility of all employees who are newly hired for employment in the United States to perform work under this PO, through participation in the E-Verify Program or the Department program established pursuant to CRS § 8-17.5-102(5)(c). Vendor shall not knowingly employ or contract with an illegal alien to perform work under this PO or enter into a contract or PO with a subcontractor that fails to certify to vendor that the subcontractor shall not knowingly employ or contract with an illegal alien to perform work under this PO. Vendor shall (a) not use E-Verify Program or Department program procedures to undertake pre-employment screening of job applicants during performance of this PO, (b) notify subcontractor and the University within three days if vendor has actual knowledge that subcontractor is employing or contracting with an illegal alien for work under this PO, (c) terminate the subcontract if subcontractor does not stop employing or contracting with the illegal alien within three days of receiving notice, and (d) comply with reasonable requests made in the course of an investigation, undertaken pursuant to CRS § 8-17.5-102(5), by the Colorado Department of Labor and Employment. If vendor participates in the Department program, vendor shall deliver to the University a written, notarized affirmation that vendor has examined the legal work status of such employee, and shall comply with all of the other requirements of the Department program. If vendor fails to comply with any requirement of this provision or CRS § 8-17.5-101 et seq., the University may terminate this PO for breach and, if so terminated, vendor shall be liable for damages.

28. Public Contracts with Natural Persons
Vendor, if a natural person eighteen (18) years of age or older, hereby swears and affirms under penalty of perjury that he or she (a) is a citizen or otherwise lawfully present in the United States pursuant to federal law, (b) shall comply with the provisions of CRS § 24-76.5-101 et seq., and (c) has produced a form of identification required by CRS § 24-76.5-103 prior to the date vendor delivers goods or begins performing services under terms of the PO.

29. Governmental Immunity.

No term or condition of this contract shall be construed or interpreted as a waiver, express or implied, of any of the immunities, rights, benefits, protections, or other provisions, of the Colorado Governmental Immunity Act, CRS §24-10-101 et seq., or the Federal Tort Claims Act, 28 U.S.C. §§1346(b) and 2671 et seq., as applicable now or hereafter amended.


The signatories aver that to their knowledge, no employee of the University has any personal or beneficial interest whatsoever in the service or property described in this contract. Contractor has no interest and shall not acquire any interest, direct or indirect, that would conflict in any manner or degree with the performance of Contractor’s services and Contractor shall not employ any person having such known interests.

31. Federal Flowdown Provisions for Federally Funded Contracts

The University of Colorado has entered into an Agreement with either the U.S. Government, or another entity who has itself entered into an Agreement with the U.S. Government. That Agreement requires that certain federal contract provisions be made a part of any subsequent Purchase Order issued by the University of Colorado related to furthering the performance or deliverables required under that Agreement.

Where necessary to make the context of these provisions applicable to this order, the term "contractor" shall mean "seller," the term "contract" shall mean "this order," and the terms "Government," "contracting officer," and equivalent phrases shall mean "the University." Seller hereby agrees to flowdown the applicable clauses to its lower-tier subcontractors, and agrees that the clauses are in effect between it and the University, as applicable.

The following provisions are from the Federal Acquisition Regulations (FAR), which are available online. (NOTE: These FAR clauses may have applicability only when the Purchase Order is at or in excess of a certain dollar threshold, shown in parentheses, or under certain circumstances.)

<table>
<thead>
<tr>
<th>FAR Citation</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>52.203-6</td>
<td>Restrictions on Subcontractor Sales to the Government ($100,000)</td>
</tr>
<tr>
<td>52.203-7</td>
<td>Anti-Kickback Procedures except Subparagraph (c)(1) ($100,000)</td>
</tr>
<tr>
<td>52.203-12</td>
<td>Limitation on Payments to Influence Certain Federal Transactions ($100,000)</td>
</tr>
<tr>
<td>52.204-2</td>
<td>Security Requirements (applicable if access to classified material is involved) ($0)</td>
</tr>
<tr>
<td>52.215-2</td>
<td>Audit and Records -- Negotiation ($100,000)</td>
</tr>
<tr>
<td>52.215-10</td>
<td>Price Reduction for Defective Cost or Pricing Data ($550,000)</td>
</tr>
<tr>
<td>52.215-12</td>
<td>Subcontractor Cost or Pricing Data ($550,000)</td>
</tr>
<tr>
<td>52.215-13</td>
<td>Subcontractor Cost or Pricing Data -- Modifications ($550,000)</td>
</tr>
<tr>
<td>FAR Citation</td>
<td>Title</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>52.215-14</td>
<td>Integrity of Unit Prices ($100,000)</td>
</tr>
<tr>
<td>52.219-8</td>
<td>Utilization of Small Business Concerns ($100,000)</td>
</tr>
<tr>
<td>52.219-9</td>
<td>Small Business and Small Disadvantaged Business Subcontracting Plans (Large Businesses) ($650,000)</td>
</tr>
<tr>
<td>52.219-16</td>
<td>Liquidated Damages -- Subcontracting Plan ($650,000)</td>
</tr>
<tr>
<td>52.222-4</td>
<td>Contract Work Hours and Safety Standards Act -- Overtime Compensation ($100,000)</td>
</tr>
<tr>
<td>52.222-21</td>
<td>Prohibition of Segregated Facilities ($10,000)</td>
</tr>
<tr>
<td>52.222-26</td>
<td>Equal Opportunity ($10,000)</td>
</tr>
<tr>
<td>52.222-35</td>
<td>Affirmative Action for Disabled Veterans and Veterans of the Vietnam Era ($25,000)</td>
</tr>
<tr>
<td>52.222-36</td>
<td>Affirmative Action for Workers with Disabilities ($10,000)</td>
</tr>
<tr>
<td>52.222-37</td>
<td>Employment Reports on Disabled Veterans and Veterans of the Vietnam Era ($25,000)</td>
</tr>
<tr>
<td>52.223-2</td>
<td>Clean Air and Water (applicable on orders issued under contracts solicited and issued prior to February 25, 2000)</td>
</tr>
<tr>
<td>52.223-6</td>
<td>Drug-Free Workplace (for individuals, $0; for non-individuals, $100,000)</td>
</tr>
<tr>
<td>52.223-7</td>
<td>Notice of Radioactive Materials (applicable if radioactive materials are involved) ($0)</td>
</tr>
<tr>
<td>52.223-14</td>
<td>Toxic Chemical Release Reporting ($100,000; N/A for acquisition of commercial items)</td>
</tr>
<tr>
<td>52.224-2</td>
<td>Privacy Act (applicable if vendor is supplying design, development, or operation of a system of records on individuals) ($0)</td>
</tr>
<tr>
<td>52.225-3</td>
<td>Buy American Act - Free Trade Agreements - Israeli Trade Act ($0)</td>
</tr>
<tr>
<td>52.225-13</td>
<td>Restrictions on Certain Foreign Purchases ($2,500)</td>
</tr>
<tr>
<td>52.226-1</td>
<td>Utilization of Indian Organizations and Indian-Owned Economic Enterprises ($0)</td>
</tr>
<tr>
<td>52.227-1</td>
<td>Authorization and Consent (applicable if in excess of the simplified acquisition threshold)</td>
</tr>
<tr>
<td>52.227-2</td>
<td>Notice and Assistance Regarding Patent and Copyright Infringement (applicable if in excess of the simplified acquisition threshold)</td>
</tr>
<tr>
<td>52.227-10</td>
<td>Filing of Patent Applications -- Classified Subject Matter ($0)</td>
</tr>
<tr>
<td>52.227-11</td>
<td>Patent Rights -- Retention by the Contractor (Short Form) ($0)</td>
</tr>
<tr>
<td>52.227-14</td>
<td>Rights in Data - General ($0)</td>
</tr>
<tr>
<td>52.230-5</td>
<td>Cost Accounting Standards -- Educational Institutions ($500,000)</td>
</tr>
<tr>
<td>52.230-6</td>
<td>Administration of Cost Accounting Standards ($500,000)</td>
</tr>
<tr>
<td>52.244-6</td>
<td>Subcontract for Commercial Items and Commercial Components ($0; non-commercial supplies or services)</td>
</tr>
</tbody>
</table>
In addition, if federal funds through a contract from an agency of the Department of Defense are involved, the following Department of Defense Federal Acquisition Regulations (DFAR) clauses apply. DFAR clauses are available online. 
(NOTE: These DFAR clauses may have applicability only when the Purchase Order is at or in excess of a certain dollar threshold, shown in parentheses, or under certain circumstances.)

<table>
<thead>
<tr>
<th>FAR Citation</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>52.245-5</td>
<td>Government Property (Cost Reimbursement, Time-and-Materials, or Labor-Hour Contracts) (paragraph &quot;g&quot; Limited risk of loss is not applicable) ($0)</td>
</tr>
<tr>
<td>52.247-63</td>
<td>Preference for U.S.-Flag Air Carriers ($100,000)</td>
</tr>
<tr>
<td>52.247-64</td>
<td>Preference for Privately Owned U.S.-Flag Commercial Vessels ($0)</td>
</tr>
</tbody>
</table>

In addition, if federal funds through a contract from the National Aeronautic and Space Administration (NASA) are involved, the following NASA Supplemental Federal Acquisition Regulations (FAR) clauses apply. NASA clauses are available online. 
(NOTE: These NASA clauses may have applicability only when the Purchase Order is at or in excess of a certain dollar threshold, shown in parentheses, or under certain circumstances.)

<table>
<thead>
<tr>
<th>NASA Citation</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1852.208-81</td>
<td>Restrictions on Printing and Duplicating, Oct 2001 ($0)</td>
</tr>
<tr>
<td>1852.219-74</td>
<td>Use of Rural Area Small Businesses, Sept 1990 ($0)</td>
</tr>
<tr>
<td>1852.219-75</td>
<td>Small Business Subcontracting Reporting, May 1999 ($500,000)</td>
</tr>
<tr>
<td>1852.223-70</td>
<td>Safety and Health, April 2002 ((1) Amount to $1,000,000 or more (unless Contracting Officer makes a written determination, after consultation with installation safety and health representatives, that this is not required); (2) Require construction, repair, or alteration in excess of $25,000; or (3) Regardless of dollar amount, involve the use of hazardous materials or operations.)</td>
</tr>
<tr>
<td>1852.227-70</td>
<td>New Technology, May 2002 ($0, for the performance of experimental, developmental, or research work)</td>
</tr>
</tbody>
</table>
30. Federal Flowdown Provisions for Federally Funded Grants

The University of Colorado has entered into an Agreement with either the U.S. Government, or another entity who has itself entered into an Agreement with the U.S. Government. That Agreement requires that certain federal grant provisions be made a part of any subsequent Purchase Order issued by the University of Colorado related to furthering the performance or deliverables required under that Agreement.

Where necessary to make the context of these provisions applicable to this order, the term "contractor" shall mean "seller," the term "contract" shall mean "this order," and the terms "Government," "contracting officer," and equivalent phrases shall mean "the University." Seller hereby agrees to flowdown the applicable clauses to its lower-tier subcontractors, and agrees that the clauses are in effect between it and the University, as applicable.

Performance by the seller under this Purchase Order constitutes certification that the seller is presently in compliance with, and will continue to comply with, the Byrd Anti-Lobbying Amendment (31 U.S.C. 1352) and Executive Orders Numbers 12549 and 12689, all as described below.

**Equal Employment Opportunity**


All contracts and subgrants in excess of $2000 for construction or repair awarded by recipients and subrecipients shall include a provision for compliance with the Copeland "Anti-Kickback" Act (18 U.S.C. 874), as supplemented by Department of Labor regulations (29 CFR part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Act provides that each contractor or subrecipient shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he is otherwise entitled. The recipient shall report all suspected or reported violations to the Federal awarding agency.

**Davis-Bacon Act, as amended (40 U.S.C. 276a to a-7)**

When required by Federal program legislation, all construction contracts awarded by the recipients and subrecipients of more than $2000 shall include a provision for compliance with the Davis-Bacon Act (40 U.S.C. 276a to a-7) and as supplemented by Department of Labor regulations (29 CFR part 5, "Labor Standards Provisions Applicable to Contracts Governing Federally Financed and Assisted Construction"). Under this Act, contractors shall be required to pay wages to laborers and mechanics at a rate not less than the minimum wages specified in a wage determination made by the Secretary of Labor. In addition, contractors shall be required to pay wages not less than once a week. The recipient shall place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation and the
award of a contract shall be conditioned upon the acceptance of the wage determination. The recipient shall report all suspected or reported violations to the Federal awarding agency.

**Contract Work Hours and Safety Standards Act (40 U.S.C. 327-333)**

Where applicable, all contracts awarded by recipients in excess of $2000 for construction contracts and in excess of $2500 for other contracts that involve the employment of mechanics or laborers shall include a provision for compliance with Sections 102 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-333), as supplemented by Department of Labor regulations (29 CFR part 5). Under Section 102 of the Act, each contractor shall be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than 1 1/2 times the basic rate of pay for all hours worked in excess of 40 hours in the work week. Section 107 of the Act is applicable to construction work and provides that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

**Rights to Inventions Made Under a Contract or Agreement**

Contracts or agreements for the performance of experimental, developmental, or research work shall provide for the rights of the Federal Government and the recipient in any resulting invention in accordance with 37 CFR part 401, "Rights to Inventions made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by the awarding agency.

**Clean Air Act (42 U.S.C. 7401 et seq.) and the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.), as amended**

Contracts and subgrants of amounts in excess of $100,000 shall contain a provision that requires the recipient to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401 et seq.) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251 et seq.). Violations shall be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).


Contractors who apply or bid for an award of $100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient.

**Debarment and Suspension (E.O.s 12549 and 12689)**

No contract shall be made to parties listed on the General Services Administration's List of Parties Excluded from Federal Procurement or Nonprocurement Programs in accordance with E.O.s 12549 and 12689, "Debarment and Suspension." This list contains the names of parties debarred, suspended, or otherwise excluded by agencies, and contracts declared ineligible under statutory or regulatory authority other than E.O. 12549. Contractors with awards that exceed the small purchase threshold shall provide the required certification regarding its exclusion status and that of its principal employees.
Access to Records (OMB Circular A-110, .48(d))

All negotiated contracts (except those for less than the small purchase threshold) awarded by recipients shall include a provision to the effect that the recipient, the Federal awarding agency, the Comptroller General of the United States, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the contractor which are directly pertinent to a specific program for the purpose of making audits, examination, excerpts and transcriptions.

31. Security Badging

All costs and time associated with obtaining a University security badge for Contractor employees working on campus shall be borne by the Contractor.
INSURANCE REQUIREMENTS (A)

Construction Purchase Order Insurance Requirements
University of Colorado Denver

For purposes of this supplement “Contractor” as used herein shall mean, as appropriate to the Contract form being used, Contractor, Standing Order Contractor or Construction Manager/General Contractor.

The Contractor shall obtain and maintain, at its own expense and for the duration of the contract including any warranty periods under the Contract are satisfied, the insurance coverages set forth below.

By requiring such insurance, the Principal Representative shall not be deemed or construed to have assessed the risk that may be applicable to the Contractor its agents, representatives, employees or subcontractors under this contract. The insurance requirements herein for this Contract in no way limit the indemnity covenants contained in the Contract. The Principal Representative in no way warrants that the limits contained herein are sufficient to protect the Contractor from liabilities that might arise out of the performance of the work under this Contract by the Contractor, its agents, representatives, employees, or subcontractors. The Contractor shall assess its own risks and if it deems appropriate and/or prudent, maintain higher limits and/or broader coverages. The Contractor is not relieved of any liability or other obligations assumed or pursuant to the Contract by reason of its failure to obtain or maintain insurance in sufficient amounts, duration, or types.

COVERAGES AND LIMITS OF INSURANCE - - Contractor shall provide coverage with limits of liability not less than those stated below.

1. **Commercial General Liability – ISO CG 0001 or equivalent. Coverage to include:**
   - Premises and Operations
   - Explosions, Collapse and Underground Hazards
   - Personal / Advertising Injury
   - Products / Completed Operations
   - Liability assumed under an Insured Contract (including defense costs assumed under contract)
   - Independent Contractors
   - Additional Insured—Owners, Lessees or Contractors Endorsement, ISO Form 2010 (2004 Edition or equivalent)
   - Additional Insured—Owners, Lessees or Contractors Endorsement (Completed Operations), ISO CG 2037 (7/2004 Edition or equivalent)
   - **The policy shall be endorsed to include the following additional insured language on the Additional Insured Endorsements specified above: “The Regents of the University of Colorado, a Body Corporate, named as an additional insured with respect to liability and defense of suits arising out of the activities performed by, or on behalf of the Contractor, including completed operations”**.
• Commercial General Liability Completed Operations policies must be kept in effect for up to three (3) years after completion of the project.

<table>
<thead>
<tr>
<th>Liability Limits</th>
<th>General Aggregate</th>
<th>Products/Completed Operation Aggregate</th>
<th>Each Occurrence</th>
<th>Personal/Advertising Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary General Liability</td>
<td>$2,000,000</td>
<td>$2,000,000</td>
<td>$1,000,000</td>
<td>$1,000,000</td>
</tr>
</tbody>
</table>

The following exclusionary endorsements are prohibited in the CGL policy:

1. Damage to work performed by subcontract/vendor (CG 22-94 or similar);
2. Contractual liability coverage exclusion modifying or deleting the definition of an “insured contract”;
3. If applicable to the work to be performed: Residential or multi-family;
4. If applicable to the work to be performed: Exterior insulation finish systems;
5. If applicable to the work to be performed: Subsidence or earth movement.

2. **Automobile Liability**

Bodily Injury and Property Damage for any owned, hired, and non-owned vehicles used in the performance of this contract

**Minimum Limits:**

Bodily Injury/Property Damage (Each Accident) $ 1,000,000

3. **Workers Compensation**

• Statutory Benefits (Coverage A)
• Employers Liability (Coverage B)

a. Policy shall contain a waiver of subrogation in favor of the Principal Representative.
b. This requirement shall not apply when a contractor or subcontractor is exempt under Colorado Workers’ Compensation Act., **AND** when such contractor or subcontractor executes the appropriate sole proprietor waiver form.

**Minimum Limits:**

<table>
<thead>
<tr>
<th>Coverage (Workers’ Compensation)</th>
<th>Coverage B (Employers Liability)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each accident</td>
<td>$ 100,000</td>
</tr>
<tr>
<td>Disease each employee</td>
<td>$ 100,000</td>
</tr>
<tr>
<td>Disease policy limit</td>
<td>$ 500,000</td>
</tr>
</tbody>
</table>

4. **Contractors Pollution Liability**

• Coverage shall apply to sudden and gradual pollution conditions resulting from the escape of release of smoke, vapors, fumes, acids, alkalis, toxic chemicals, liquids, or
gases, natural gas, waste materials, or other irritants, contaminants, or pollutants (including asbestos). Policy shall cover the Contractor’s completed operations.

- If the coverage is written on a claims-made basis, the Contractor warrants that any retroactive date applicable to coverage under the policy precedes the effective date of this Contract; and that continuous coverage will be maintained or an extended discovery period will be exercised for a period of three (3) years beginning from the time that work under this contract is completed.

- **The policy shall be endorsed to include the following as Additional Insureds:** The Regents of the University of Colorado, a Body Corporate, named as an additional insured with respect to liability and defense of suits arising out of the activities performed by, or on behalf of the Construction Manager, including completed operations.

- Endorsements CA9948 and MCS-90 are required on the Automobile Liability Coverage if the Contractor is transporting any type of hazardous materials.

- **Contractors Pollution Liability policies must be kept in effect for up to three (3) years after completion of the project.**

**Minimum Limits:**

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</thead>
<tbody>
<tr>
<td>Per Loss</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Aggregate</td>
<td>$1,000,000</td>
</tr>
</tbody>
</table>

5. **Professional Liability (Errors and Omissions)**

*(This Professional Liability requirement applies only to Design/Build Projects.)*

- The Contractor shall maintain Errors and Omissions Liability covering negligent acts, errors and/or omissions, including design errors of the Contractor for damage sustained by reason of or in the course of operations under this Contract. The policy/coverages shall be amended to include the following:

  Amendment of any Contractual Liability Exclusion to state: “This exclusion does not apply to any liability of others which you assume under a written contract provided such liability is caused by your negligent acts.”

- In the event that any professional liability insurance required by this Contract is written on a claims-made basis, Contractor warrants that any retroactive date under the policy shall precede the effective date of this Contract; and that either continuous coverage will be maintained or an extended discovery period will be exercised for a period of three (3) years beginning at the time work under this Contract is completed.

- Policy shall contain a waiver of subrogation against The Regents of the University of Colorado, a Body Corporate.

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</thead>
<tbody>
<tr>
<td>Wrongful Act</td>
<td>$2,000,000</td>
</tr>
<tr>
<td>General Aggregate</td>
<td>$2,000,000</td>
</tr>
</tbody>
</table>
6. **Builder’s Risk/ Installation Floater**

For projects of $100,000 or more or otherwise provided or instructed by the Principal Representative, the Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the project is located, Builder’s Risk Insurance in the amount of the initial contract amount as well as subsequent modifications for the entire project at the site on a replacement cost basis without optional deductibles. This coverage is required for new buildings or additions to existing buildings and for materials and equipment to be installed in existing structures.

- Covered Cause of Loss: Special Form
- Include Theft and Vandalism
- Labor costs to repair damaged work
- Shall be written for 100% of the completed value (replacement cost basis)
- Deductible maximum is $50,000.00
- Waiver of Subrogation is to apply
- The Regents of the University of Colorado, a body corporate, shall be added as Additional Named Insured on Builders Risk.

1. Policy must provide coverage from the time any covered property becomes the responsibility of the Contractor, and continue without interruption during construction, renovation, or installation, including any time during which the covered property is being transported to the construction installation site, or awaiting installation, whether on or off site.

2. The Policy shall be maintained, unless otherwise provided in the contract documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made or until no person or entity other than the Principal Representative has insurable interest in the property to be covered, whichever is later.

3. The Builder’s Risk insurance shall include interests of the Principal Representative, and if applicable, affiliated or associated entities, the General Contractor, subcontractors and sub-tier contractors in the project.

4. Builders’ Risk Coverage shall be on a **Special** Covered Cause of Loss Form and shall include theft, vandalism, malicious mischief, collapse, false-work, temporary buildings and debris removal including demolition, increased cost of construction, architect’s fees and expenses, flood (including water damage), earthquake, and if applicable, all below and above ground structures, piping, foundations including underground water and sewer mains, piling including the ground on which the structure rests and excavation, backfilling, filling, and grading. Equipment Breakdown Coverage (a.k.a. Boiler & Machinery) shall be included as required by the Contract Documents or by law, which shall specifically cover insured equipment during installation and testing (including hot testing, where applicable). Other coverages may be required if provided in contract documents.

5. The Builders’ Risk shall be written for 100% of the completed value (replacement cost basis) of the work being performed. The Builders’ Risk shall include the following provisions:
   a. Replacement Cost Basis - including modification of the valuation clause to cover all costs needed to repair the structure or work (including overhead and profits) and will
pay based on the values figured at the time of rebuilding or repairing, not at the time of loss

b. Modify or delete exclusion pertaining to damage to interior of building caused by an
perils insured against are covered; also provide coverage for water damage

Note, if the addition, or renovation is to an existing building, The Principal
Representative requires that the Contractor provide as an option to include the existing
building into the Builders’ Risk Policy. The Principal Representative shall provide the
replacement cost value of the existing building

6. At the option of the Principal Representative, the Principal Representative may include Soft
Costs (including Loss of Use)/Delay in Opening Endorsement under the builder’s risk
policy. The Principal Representative agrees to provide the necessary exposure base
information for quotation by the Builder’s Risk carrier. The Principal Representative
agrees to pay the premium associated with the Soft Costs coverage, the Principal
Representative decides to purchase this coverage.

7. The Builders’ Risk Policy shall specifically permit occupancy of the building during
construction. Partial occupancy or use of the work shall not commence until the insurance
company or companies providing insurance have consented to such partial occupancy or
use. The Principal Representative and Contractor shall take reasonable steps to obtain
consent of the insurance company or companies and delete any provisions with regard to
restrictions within any Occupancy Clauses within the Builders’ Risk Policy. The Builders’
Risk Policy shall remain in force until acceptance of the project by the Principal
Representative.

8. The deductible shall not exceed $50,000 and shall be the responsibility of the Contractor
except for losses such as flood (not water damage), earthquake, windstorm, tsunami,
volcano, etc. Losses in excess of $50,000 insured shall be adjusted in conjunction with the
Principal Representative. Any insurance payments/proceeds shall be made payable to the
Principal Representative subject to requirements of any applicable mortgagee clause. The
Contractor shall pay subcontractors their just shares of insurance proceeds received by the
Contractor, and by appropriate agreements, written where legally required for validity, shall
require subcontractors to make payments to their sub-subcontractors in similar manner.

The Principal Representative shall have the authority to adjust and settle any losses in
excess of $50,000 with insurers unless one of the parties in interest shall object in writing
within five days after occurrence of loss to the Principal Representative exercise of this
power. It is expressly agreed that nothing in this section shall be subject to arbitration and
any references to arbitration are expressly deleted.

9. The Contractor is responsible for providing 45 days’ notice of cancellation to the Principal
Representative. The policy shall contain all generally applicable conditions, definitions,
exclusions and endorsements related to the Project.

If the Contractor does not intend to purchase such Builder’s Risk Insurance required by the
Contract and with all of the coverages in the amount described above, the Contractor shall
so inform the Principal Representative as stated in writing prior to commencement of the
work. The Principal Representative may then affect insurance that will protect the interests
of the Principal Representative, the General Contractor, Subcontractors and sub-tier
contractors in the project. Coverages applying shall be the same as stated above including
other coverages that may be required by the Principal Representative. The cost shall be
charged to the Contractor. Coverage shall be written for 100% of the completed value of the work being performed, with a deductible not to exceed $50,000 per occurrence for most projects. All deductibles will be assumed by the Contractor. Waiver of Subrogation is to apply against all parties named as insureds, but only to the extent the loss is covered, and Beneficial Occupancy Endorsements are to apply.

If the Principal Representative is damaged by the failure or neglect of the Contractor to purchase or maintain insurance as described above, without so notifying the Principal Representative, then the Contractor shall bear all reasonable costs properly attributable thereto.

**ADDITIONAL INSURANCE REQUIREMENTS**

1. All insurers must be licensed or approved to do business within the State of Colorado, and unless otherwise specified, all policies must be written on a per occurrence basis.
2. Contractor’s insurance carrier should possess a minimum A.M. Best’s Insurance Guide rating of A- VI.
3. On insurance policies where the Principal Representative are named as additional insureds, the Principal Representative shall be additional insureds to the full limits of liability purchased by the Contractor even if those limits of liability are in excess of those required by this Contract.
4. Contractor shall furnish the Principal Representative with certificates of insurance (ACORD form or equivalent approved by the Principal Representative) as required by this Contract. The certificates for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf.
   All certificates and any required endorsements are to be received and approved by the Principal Representative before work commences. Each insurance policy required by this Contract must be in effect at or prior to commencement of work under this Contract and remain in effect for the duration of the project. Failure to maintain the insurance policies as required by this Contract or to provide evidence of renewal is a material breach of contract.
5. Upon request by the Principal Representative, Contractor must provide a copy of the actual insurance policy effecting coverage(s) required by the contract.
6. The Contractor’s insurance coverage shall be primary insurance and non-contributory with respect to all other available resources.
7. The Contractor shall advise the Principal Representative in the event any general aggregate or other aggregate limits are reduced below the required per occurrence limit. At their own expense, the Contractor will reinstate the aggregate limits to comply with the minimum requirements and shall furnish to the Principal Representative a new certificate of insurance showing such coverage is in force.
8. Provide a minimum of thirty (30) days advance written notice to the Principal Representative for cancellation, non-renewal, or material changes to policies required under the Contract (45 days for builders’ risk coverage).

Failure of the Contractor to fully comply with these requirements during the term of the Contract may be considered a material breach of contract and may be cause for immediate termination of
the Contract at the option of the Principal Representative. The Principal Representative reserves the right to negotiate additional specific insurance requirements at the time of the contract award.

**Subcontractors**
Contractor’s certificate(s) shall include all subcontractors as additional insureds under its policies or subcontractors shall maintain separate insurance as determined by the Contractor, however, subcontractor's limits of liability shall not be less than $1,000,000 per occurrence / $2,000,000 aggregate.

**Non-Waiver**
The parties hereto understand and agree that The Principal Representative is relying on, and does not waive or intend to waive by any provision of this Contract, the monetary limitations or any other rights, immunities, and protections provided by the Colorado Governmental Immunity Act, et seq., as from time to time amended, or otherwise available to the Principal Representative or its officers, employees, agents, and volunteers.

**Mutual Cooperation**
The Principal Representative and Contractor shall cooperate with each other in the collection of any insurance proceeds which may be payable in the event of any loss, including the execution and delivery of any proof of loss or other actions required to effect recovery.

**Revised March 12, 2012 MB**
Supplemental Checklist for Projects Under $150K

Project Number & Name:  18-116156 / B500 1st Reno Rm C1011
Contractor: ____________________________________________________________

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<th>Activity</th>
<th>Date Completed</th>
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<tr>
<td>1. A copy of the “as-built” drawings has been given to the Archive Officer. (Art)</td>
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<td>2. Maintenance and Operations manuals, attic stock, and interior finishes information, if included in Contractor’s scope, has been received by the Building Information Coordinator. (Dave R.)</td>
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<td>3. Warranty Dates and Contact list for all Contractors and Suppliers given to BMO.</td>
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<td>4. For all areas to be transferred to university, all interior and exterior areas are cleared, cleaned and in good repair.</td>
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<td>5. All required permits have been closed.</td>
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<tr>
<td>6. Other:</td>
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__________________________________________  ___________________________
University Project Manager                   Anschutz or Denver Campus BMO Rep

__________________________________________  ___________________________
University FSS Rep                             Date

Mark N/A by item if it is not applicable to project.
PROJECT DIRECTORY FOR
Q20-C1011 Suite Remodel
B500 1st Renovation Room C1011
UCD Project No. 18-116156

University of Colorado
Denver
Anschutz Medical Campus
Aurora, Colorado

University Contact

University of Colorado, Denver
Anschutz Medical Campus
1045 Wheeling Street
Mail Stop418
Aurora, Co 80045

David Wegener, Project Manager, Facilities Projects
david.wegener@ucdenver.edu
Phone: 303.724.1245
Fax: 303.724.0931

Architectural

2WR of Colorado, Inc.
7430 East Caley Ave, Suite 280E
Centennial, CO 80111
720.258.4780

Sam Andras, AIA, Principal in Charge
sam@2wrarch.com

Darcey Wenzel, AIA, LEED BD+C, Project Manager
darcey@2wrarch.com

Shelley Thomson, Interior Designer
shelley@2wrarch.com
Electrical

DVO Professional Engineers  
1741 California Street #100  
Denver, CO 80202  
720.479.0502

Jeff Bentley, PE  
jbentley@dvoeng.com.com
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NONE

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NONE

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NONE

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NONE

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NONE

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NONE

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NONE

END OF SECTION 00 01 00
SECTION 00 01 25

INTRODUCTION TO GUIDELINES

PART 1 - GENERAL

1.1 INTRODUCTION TO DIVISION 01 “GENERAL REQUIREMENTS” MASTER SPECIFICATION

A. Specification Master: The University has prepared a complete Division 01 “General Requirements” master specification required for use on all University projects by Architects, Engineers, and other Design Professionals who provide design services for the University. The master specification has been written to provide a consistent set of general requirements from project to project. They represent the University’s preferred administrative and procedural requirements and are coordinated with State of Colorado Contracts for Construction and General Conditions.

B. Denver Campus and Anschutz Medical Campus: There are a number of procedures and requirements that differ between the Denver and Anschutz Medical Campuses. As such, the University has developed a unique master for each campus. The Design Professional should take care to obtain the correct campus specific master from the University Project Manager.

C. Editing Division 01 Master Specifications: It is the intent of these masters to require a minimum amount of editing; however, in all cases some editing will be required to reflect project specific conditions and requirements.

   1. Obtaining master specification: The University Project Manager will provide the Design Professional with an editable copy of the Division 01 master in Microsoft Word format.

   2. Editor’s notes: Editor’s notes are found throughout the text where the Design Professional is required to make a choice and/or edit the subsequent paragraph(s) in the Section Text based on project specific requirements. Editor’s notes are indicated by Blue, Arial 8pt font surrounded by a thin black line as indicated below. Delete the editor’s notes after making the indicated edits.

   3. Options: Optional selections in the Section Text are indicated by a bold font surrounded by brackets. To edit the option, delete all text that is not applicable, remove brackets from around the applicable choice, and change font from bold to normal face. The following is an example of what an editor’s note and optional text look like in the Section Text.

   a. 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.

4. Format: Do not change format, including but not limited to font typeface and size, page margins, header and footer layout, outline numbering and indents.

   a. Outline numbering: The document template is set up so that outline numbering is automatic. Use the “Decrease Indent” and “Increase Indent” buttons on the “Paragraph” menu to demote or promote a paragraph in the outline respectively.
b. Styles: Automatic numbering, formatting and indents are controlled by the use of Styles within the Microsoft Word document. It is suggested that the editor become familiar with this software capability before editing.

1) Warning: Do not cut and paste text from another document into the master unless familiar with software capability to change Styles. Imported text carries with it Styles from the document of origin and will damage the auto-numbering capability of the template unless the appropriate document styles are applied after inserting.

2) Hierarchy of styles: The following is the hierarchy of styles within each document:

   PRT (PART 1)
   ART (1.1)
   PR1 (A.)
   PR2 (1.)
   PR3 (a.)
   PR4 (1)
   PR5 (a)

3) Section Title and End of Section: Styles for these are SCT and EOS respectively.

D. Sustainable Design: For projects required to obtain LEED certification, the Design Professional in conjunction with the University Project Manager is required to develop project specific Section 01 81 13 “Sustainable Design Requirements” and Section 01 91 13 “General Commissioning Requirements” for inclusion into Division 01. A Section master is provided for Section 01 74 19 “Construction Waste Management and Disposal.” This section should be included in Division 01 only for projects pursuing LEED certification.

E. Commissioning: The University may choose to engage a Commissioning Agent (CxA) and provide commissioning on projects, even if not pursuing LEED certification. Coordinate project commissioning requirements with University Project Manager and, if required, develop Section 01 91 13 "General Commissioning Requirements" for inclusion in Division 01. Coordinate general commissioning requirements with other required commissioning activities indicated in Mechanical and Electrical Sections, including but not limited to testing and balancing and equipment startup requirements.

F. Large Project versus Small Project: There are a number of options in the Section Text that distinguish between a large project and a small project. Make the appropriate selection in consultation with University Project Manager. In general, small projects are those with a construction budget of less than $500,000.

1.2 INTRODUCTION TO DIVISION 02 – 33 GUIDELINES

A. Guidelines: The University has prepared these Guidelines for the benefit and use of Architects, Engineers, and other Design Professionals who provide design services for the University. Divisions 02 through 33 are not intended to be project specifications, nor do they cover all materials and systems which may be required for any given project. These Guidelines represent the University’s preferences for the various systems and materials indicated but may not be suitable in all cases. They represent a minimum acceptable level of quality and in some cases indicate preferred and/or required material manufacturers to be used on all projects. Any deviations from this Guideline shall be clearly identified in writing and approved by the University.

B. University Materials Preferences: In order to be concise and useful to the Design Professional, the Guidelines focus only on materials, systems and/or standards where the University has a preference or where the University standard is higher than that typically accepted within the design and construction
industry. In all other cases, it is the Design Professional’s responsibility to select and specify appropriate industry standards to govern the fabrication and installation of the work. For example, in SECTION 03 30 00 – CAST-IN-PLACE CONCRETE, the Guidelines do not list ACI 301 – *Specification for Structural Concrete* as a reference standard because it is expected that the Design Professional would include this reference standard as a customary matter of practice without direction to do so by the Guidelines.

1.3 Designer-of-Record Responsibility

A. Notwithstanding the above, the Architect, Engineer, or other Design Professional using this Specification Master and Guideline understands that they alone are the professional designer of record and wholly responsible for the incorporation and/or specification of any and all selections of either systems, components, materials, and/or manufacturers as may be required and appropriate for the design. The Design Professional is both required and expected to evaluate the suitability of all materials and systems indicated herein for the purpose intended. They alone shall be considered as author of and fully responsible for the entire design. No claim shall be made of or considered by the University or any of its Consultants who assisted the University in authoring these Guidelines related to any design defect alleged to have resulted from the Design Professionals compliance with these Guidelines. By accepting and using these Guidelines the Design Professional acknowledges the above and the limitations indicated therein.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 00 01 25
SECTION 00 73 46 - WAGE DETERMINATION SCHEDULE

PART 1 - GENERAL

1.1 DAVIS-BACON WAGE DETERMINATIONS

A. Coordinate with the University Project Manager to determine if applicable.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 00 73 46
SECTION 01 00 00 - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Design Requirements:
   1. Designer Responsibility: Based on a series of meetings with the University Project Manager and applicable University staff, draft Division 01 Specification Sections consistent with State of Colorado Construction Contract provisions, General and Supplementary Conditions of the Contract, including requirements for administrative procedures consistent with the size and scope of the project.

   2. Content: Include, as applicable, the following Sections:
      a. SECTION 01 00 00 – SUMMARY.
      b. SECTION 01 25 00 – SUBSTITUTION PROCEDURES.
      c. SECTION 01 26 00 – CONTRACT MODIFICATION PROCEDURES.
      d. SECTION 01 31 00 – PROJECT MANAGEMENTS AND COORDINATION.
      e. SECTION 01 32 33 – PHOTOGRAPHIC DOCUMENTATION.
      f. SECTION 01 33 00 – SUBMITTAL PROCEDURES.
      g. SECTION 01 35 00 – SPECIAL PROCEDURES.
         1) This Section includes special environment health and safety procedures unique to work at University projects.
      h. SECTION 01 35 46 – INDOOR AIR QUALITY PROCEDURES
         1) This Section includes special procedures required by the University to maintain a high level of indoor air quality both during construction and subsequent to occupancy.
      i. SECTION 01 40 00 – QUALITY REQUIREMENTS.
      j. SECTION 01 41 00 – REGULATORY REQUIREMENTS.
      k. SECTION 01 42 00 – REFERENCES.
      l. SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS.
      m. SECTION 01 60 00 – PRODUCT REQUIREMENTS.
      n. SECTION 01 73 00 – CLOSEOUT PROCEDURES.
      o. SECTION 01 74 19 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
      p. SECTION 01 78 23 – OPERATION AND MAINTENANCE DATA.
      q. SECTION 01 78 39 – PROJECT RECORD DOCUMENTS.
      r. SECTION 01 78 46 – EXTRA STOCK MATERIALS.
      s. SECTION 01 79 00 – DEMONSTRATION AND TRAINING.
      t. SECTION 01 81 13 – SUSTAINABLE DESIGN REQUIREMENTS.
      u. SECTION 01 91 13 – GENERAL COMMISSIONING REQUIREMENTS.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 00 00
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.
   2. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of University's facilities and for the provision of temporary construction barriers and dust partitions.

1.3 PROJECT INFORMATION
   1. Project Location: Building 500, 13001 East 17th Place.

B. Principal Representation: University of Colorado Denver.
   1. University's Representative: David Wegener, Project Manager Facilities Projects.
      (303) 724-1245
      david.wegener@ucdenver.edu

C. Architect:
   1. Sam Andras, 2WR + Partners
      7430 E. Caley Avenue, Suite 280E
      Centennial, Colorado 80111
      (720) 258-4780
D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Electrical Engineer: Jeff Bentley, DVO Professional Engineers
   1641 California Street #100
   (720) 479-0502
   jbentley@dvoeng.com

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:

1. The project scope consists of minor renovations to an existing 820 SF office suite. The project includes partial replacement of the acoustical ceiling, grid and lighting. New doors and tempered glazing will be added to the existing wall layout.

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.

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 shown 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. Contractor will receive, unload, move, set in position, anchor and connect such items and put them into operating condition.
   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.
      3. As part of this Project, replace damaged lawns, sprinkler systems, sidewalks and any other existing site improvements within staging area and access ways.
   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 University “Procedure for Approval of Regulatory Signage, Traffic Control Devices and for Street Closures at the Anschutz Medical Campus” and “AMC Campus Street and Parking Lot Closure Request” available through University Project Manager.

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 of Aurora for any disruption to or temporary closures of public city streets. Coordinate procurement of permits with Anschutz Medical Campus Liaison and University Project Manager.

D. Construction Parking:

1. General: Contractor must pay for all parking and, if available, may be assigned parking spaces in designated contractor parking lots. Parking in lots designated for visitors and patients is not permitted. Make arrangements for designated spaces and payment for long term parking with University Parking Services through the University Project Manager.

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 weathertight 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 building(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 6:00 p.m., Monday through Friday.
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.
2. Noise outside Normal Working Hours: Schedule construction work or demolition work outside of normal working hours with University Project Manager at minimum of 72 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.

E. Use of Existing Elevators: Use “freight” elevators only and protect finishes during transport. Restrict use exclusively to time required to move construction materials.

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: Restrict use exclusively to time required to unload and move construction materials.

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 or on any adjacent property.

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.

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
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 matrix of utility sources applicable to Project.

1.3 QUALITY ASSURANCE
A. Comply with utility company and regulatory agency codes, standards, and guidelines for the provision of new or extension of exiting utilities.

1.4 UTILITY SOURCE MATRIX
A. The following matrix summarizes utility responsible for provision of utility service:
<table>
<thead>
<tr>
<th>Utility Source</th>
<th>AMC</th>
<th>DC</th>
<th>AMC</th>
<th>DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steam</td>
<td>University</td>
<td>Developer</td>
<td>Xcel</td>
<td>University</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>University</td>
<td>Developer</td>
<td>University</td>
<td>University</td>
</tr>
<tr>
<td>Electricity</td>
<td>University</td>
<td>Developer</td>
<td>Xcel</td>
<td>University</td>
</tr>
<tr>
<td>Storm Drainage</td>
<td>COA</td>
<td>Developer</td>
<td>University</td>
<td>University</td>
</tr>
<tr>
<td>Sanitary Sewer</td>
<td>COA</td>
<td>Developer</td>
<td>University</td>
<td>University</td>
</tr>
<tr>
<td>Water</td>
<td>COA</td>
<td>Developer</td>
<td>University</td>
<td>University</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>University</td>
<td>Developer</td>
<td>University</td>
<td>University</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>Xcel</td>
<td>Developer</td>
<td>University</td>
<td>University</td>
</tr>
</tbody>
</table>

**University:** University of Colorado Denver
**Note 1:** University owns Trunk steam and chilled water from CUP to vault

**COA:** City of Aurora
**Note 2:** University owns Trunk electrical from switch gear to manhole

**DW:** Denver Water
**Note 3:** University owns Trunk telecom ductbank from main switch to manhole. Developer owns cable from switch to building

**Developer:**
**Note 4:** Xcel has license agreement with University

**Note 5:** University and COA jointly permit

University, TCH, UCH. In Tract lines are owned by the building they are feeding.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 18 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 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

A. Additive Alternate No. 1: Lighted Feature Wall
   1. Base Bid: Wall at Reception to include clerestory glazing with aluminum channel. Wall to be painted with accent color listed on finish plan.
   2. Alternate: Add lighted feature wall blocking and plywood substrate. LED tape lighting to be installed at vertical edges of feature wall with applied dimensional wall covering.

B. Additive Alternate No. 2: Replace Ceiling Grid and Acoustic Tile
   1. Base Bid: Existing ceiling grid and acoustic tile to remain.
   2. Alternate: Replace existing ceiling grid and acoustic tile in Reception (including hall), Office A, Office B, & Office E.

C. Additive Alternate No. 3: Wood Wall Base
   1. Base Bid: Existing wall base to remain. Patch as needed.
   2. Alternate: Replace existing wall base with solid birch base to match CU Foundation renovation at ground floor.

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 23 00 "Alternates" for products selected under an alternate, if applicable.
      2. 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.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

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.
5. For projects required to obtain LEED certification, Division 01 Section "Sustainable Design
Requirements" for administrative requirements governing submittal of cost breakdown
information required for LEED documentation.

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.
   a. Include separate line items under Contractor and principal subcontracts for LEED documentation, where applicable, and other Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

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 thereto. 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.
PAYMENT PROCEDURES

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.

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:

<table>
<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>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment motors</td>
<td>I</td>
<td>MI</td>
<td>MI</td>
<td>EI</td>
<td>--</td>
</tr>
<tr>
<td>Motor starters, contactors and overload heaters</td>
<td>MI</td>
<td>EI</td>
<td>EI</td>
<td>EI</td>
<td>MI</td>
</tr>
<tr>
<td>Fused and unfused disconnect switches</td>
<td>EI**</td>
<td>EI**</td>
<td>EI**</td>
<td>EI</td>
<td>--</td>
</tr>
<tr>
<td>Manual operating switches, speed switches, push-button stations and pilot lights</td>
<td>MI</td>
<td>EI</td>
<td>EI</td>
<td>EI</td>
<td>EI</td>
</tr>
<tr>
<td>Duct detectors</td>
<td>EI</td>
<td>MI</td>
<td>MI</td>
<td>EI</td>
<td>MI</td>
</tr>
<tr>
<td>Control relays and transformers</td>
<td>MI</td>
<td>MI</td>
<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>
<td>MI</td>
</tr>
<tr>
<td>Temperature control panels</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
<td>EI</td>
<td>MI</td>
</tr>
<tr>
<td>Motor and solenoid valves, damper motors, PE and EP</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
<td>--</td>
<td>MI</td>
</tr>
<tr>
<td>switches</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
<td>EI</td>
<td>MI</td>
</tr>
<tr>
<td>------------------</td>
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<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Refrigeration equipment, cooling tower and controls</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
<td>EI</td>
<td>MI</td>
</tr>
<tr>
<td>Electric meters</td>
<td>EI</td>
<td>EI</td>
<td>EI</td>
<td>EI</td>
<td>MI</td>
</tr>
<tr>
<td>Steam meters</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
</tr>
<tr>
<td>Chilled water meters</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
</tr>
<tr>
<td>Water meters</td>
<td>MI**</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
</tr>
</tbody>
</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.
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. Use CSI Log Form 13.2B or Contractor-generated form of substantially same content. 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 WEB SITE (NOT REQUIRED)
A. Provide, administer, and use Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:

1. Project directory.
2. Project correspondence.
3. Meeting minutes.
5. RFI forms and logs.
7. Electronic submittal document hosting, viewing and transmitting.
8. Drawing and specification document hosting, viewing, and updating.
10. Change orders.
11. Daily reports.
12. Punchlists.

B. Provide up to twenty-five (25) Project Web site user licenses for use of the University, Architect/Engineer, and Architect/Engineer's consultants. Provide eight hours of software training at Project Site office for Project Web site users.

C. On completion of Project, provide one each complete archive copy of Project Web site files to University and to Architect/Engineer in a digital storage format acceptable to Architect/Engineer.

D. Software:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Meridian Systems; Prolog or ProjectTalk under their current published licensing agreements. Comparable software by other software suppliers may be provided if approved in writing at the sole discretion of the Architect/Engineer in consultation with the University Project Manager.

E. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement in the form of Agreement acceptable to University and Architect/Engineer.

1.9 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify 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.
      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.
I. 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. LEED Coordination Conference: For projects pursuing LEED certification, schedule and conduct a LEED coordination conference before starting construction, at a time convenient to University Architect/Engineer, and Contractor.

1. 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. Architect/Engineer and their consultants.

c. Contractor’s project manager, superintendent and LEED coordinator.

d. Major subcontractors and suppliers.

e. Other concerned parties.

2. Agenda: Discuss items of significance that could affect meeting requirements for LEED certification, including the following:

a. LEED Project Checklist.

b. Procedures for selecting and monitoring status for achieving Project goals related to recycled content and regional materials.

c. General requirements for LEED-related procurement and documentation.

d. Project closeout requirements and LEED certification procedures.

e. Role of LEED coordinator.

f. Construction waste management.

g. Construction operations and LEED requirements and restrictions.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

D. 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 RFIs.
   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.

First option in Paragraph below is for Large Projects; second option for Small Projects.

E. 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.

F. 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.

b. Site Safety.
c. Indoor Air Quality Management monitoring.
d. MS4 Storm Water and Water Quality monitoring.
e. Quality:

1) Quality and work standards.
2) Status of correction of deficient items.
3) Progress cleaning.
4) Field observations.

f. Status of submittals.
g. Status of RFIs.
h. Status of Changes including:

1) Change Order Bulletins.
2) Change Order Proposals.
3) Change Orders.
4) Pending claims and disputes.

i. Status of LEED documentation, for projects pursuing LEED certification.
j. 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.

G. 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
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. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

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

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

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

G. Resource Loading: The allocation of manpower necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. Working electronic copy of schedule file, where indicated.
   2. PDF electronic file 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. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
   1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
   2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
   3. Total Float Report: List of all activities sorted in ascending order of total float.
   4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

D. 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.

E. Daily Construction Reports: Submit at weekly intervals.

F. Material Location Reports: Submit at monthly intervals.

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

H. Special Reports: Submit at time of unusual event.
1.6 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.
D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using contractor’s preliminary schedule and startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
   a. Preparation and processing of submittals.
   b. Mobilization and demobilization.
   c. Purchase of materials.
   d. Delivery.
   e. Fabrication.
   f. Utility interruptions.
   g. Installation.
   h. Work by University that may affect or be affected by Contractor's activities.
   i. Testing and commissioning.
   j. Punch list and final completion.
   k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Assign activities and costs for mobilization, bonds, permits and insurance. Obtain Architect/Engineer’s approval prior to assigning costs to material procurement activities if intending to bill for materials stored on site. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, LEED documentation, and demonstration and training (if applicable), in the amount of not more than 5 percent of the Contract Sum.
   a. Each activity cost shall reflect an appropriate value subject to approval by Architect/Engineer.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
5. Changes in the critical path.
6. Changes in total float or slack time.

H. Summary Reports: With each schedule update, at a minimum provide the following hard copy cost and resource reports:

1. Cost report showing activity dollar value, dollar value of work in place to-date and dollar value for current period.
2. Cost report showing activity dollar value, dollar value of work in place to-date, and dollar value for current period summarizing to schedule of values.
3. Resource report showing man-day allocations by specific trade on each activity.
5. Cash flow report showing monthly projections of expenditures.
6. Narrative schedule report documenting:
   a. Description of the actual work accomplished during the reporting period.
   b. Description of any problem areas.
   c. Description of current and anticipated delays with recommended corrective actions to mitigate such delays.
   d. A list of proposed modifications, additions, deletions, and changes in logic to the approved construction schedule.

2.5 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.

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.

2.6 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. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: University may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. 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.

C. 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 32 33
PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Final completion construction photographs.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting photographic documentation.
2. Section 01 77 00 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For photographer.

B. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

C. Digital Photographs: Submit image files within three business days of taking photographs.

1. Digital Camera: Minimum sensor resolution of 12 megapixels.
2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
3. Identification: Provide the following information with each image description in file metadata tag:
   a. Name of Project.
   b. Name and contact information for photographer.
   c. Name of Architect/Engineer.
   d. Name of Contractor.
   e. Date photograph was taken.
   f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
   g. Unique sequential identifier keyed to accompanying key plan.
1.4 QUALITY ASSURANCE
   A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.5 USAGE RIGHTS
   A. Obtain and transfer copyright usage rights from photographer to University for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA
   A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS
   A. Photographer: Engage a qualified photographer to take construction photographs.
   B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
      1. Maintain key plan with each set of construction photographs that identifies each photographic location.
   C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
      1. Date and Time: Include date and time in file name for each image.
      2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect/Engineer.
   D. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect/Engineer.
      1. Flag construction limits before taking construction photographs.
      2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
      3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

E. Periodic Construction Photographs: Take [20] <Insert number> photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

F. Architect/Engineer-Directed Construction Photographs: From time to time, Architect/Engineer will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

G. Final Completion Construction Photographs: Take [20] <Insert number> color photographs after date of Substantial Completion for submission as project record documents. Architect/Engineer will inform photographer of desired vantage points.

1. Do not include date stamp.

H. Additional Photographs: University through Architect/Engineer may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.

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

END OF SECTION 01 32 33
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.
13. Anschutz Medical Campus Street Services Request.

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.


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. 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.

3. 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.
   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:
   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. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately [6 by 8 inches] on label or beside title block to record Contractor's review and approval markings and action taken by Architect/Engineer.
3. Include the following information for processing and recording action taken:
   a. Project name.
   b. Date.
   c. Name of Architect/Engineer.
   d. Name and address of Contractor.
   e. Name and address of subcontractor.
   f. Name and address of supplier.
   g. Name of manufacturer.
   h. Submittal number or other unique identifier, including revision identifier.

   1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

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

4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect/Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
   a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect/Engineer.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect/Engineer will return without review submittals received from sources other than Contractor.
   a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

      1) Project name.
      2) Date.
      3) Destination (To:).
      4) Source (From:).
      5) Name and address of Architect/Engineer.
      6) Name and address of Contractor.
      7) Name of firm or entity that prepared submittal.
      8) Names of subcontractor, manufacturer, and supplier.
      9) Category and type of submittal.
     10) Submittal purpose and description.
     11) Specification Section number and title.
     12) Specification paragraph number or drawing designation and generic name for each of multiple items.
     13) Drawing number and detail references, as appropriate.
14) Indication of full or partial submittal.
15) Transmittal number.
16) Submittal and transmittal distribution record.
17) Remarks.
18) Contractor's certification that information complies with Contract Document requirements.
19) Signature of transmitter.

E. 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.

4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to University, containing the following information:
   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.
   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.

F. Options: Identify options requiring selection by Architect/Engineer.
G. 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.

H. Contractor Certification: On transmittal include Contractor's certification that information complies with Contract Document requirements.

I. 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.

J. 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.

K. 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.

L. 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.”

M. 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. Post electronic submittals as PDF electronic files directly to [Project Management Software Web site] specifically established for Project.

2. 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.

3. 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.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

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.
SUBMITTAL PROCEDURES

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.

2.2 DELEGATED-DESIGN SERVICES

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

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect/Engineer.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

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 44

SPECIAL PROCEDURES FOR ENVIRONMENTAL HEALTH AND SAFETY AND FIRE AND LIFE SAFETY

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 special administrative and procedural requirements related to environmental health and safety.

B. University is Authority Having Jurisdiction (AHJ) for Fire and Life Safety. This responsibility is administered by the University’s Fire and Life Safety Officer.

C. Related Requirements:

1. Section 01 35 46 “Indoor Air Quality Procedures” for procedure related to maintaining indoor air quality during construction.

2. Section 02 81 00 “Transportation/Disposal of Hazardous Materials.”

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 ENVIRONMENTAL HEALTH AND SAFETY AND FIRE AND LIFE SAFETY PROCEDURES

A. Physical, Life, and Fire Safety:

1. All contractors are required to conform to the Federal Occupational Safety and Health Administration (OSHA) regulations for construction (29 CFR 1926). Certain General Industry Standards (29 CFR 1910) may also apply, depending on location of work.

2. Provide an effective health and safety program to control hazards, including but not limited to compressed gases, welding, electrical, safety netting, cranes, scaffolding and supplies on the roof.

3. Provide fire protection in all construction areas to the satisfaction of the Authority Having Jurisdiction.

4. During the construction phase, the Authority Having Jurisdiction may conduct oversight inspections to observe and provide recommendations regarding applicable safety standards. The following minimum items are included:

   a. Do not block exit corridors. Install signage clearly identifying exit routes.

   b. Provide physical barriers with appropriate warning signage to protect public areas from construction work.
c. Conduct daily inspections to eliminate fire hazards and any other safety hazards.
d. Periodic safety inspections will be performed on job sites by the Authority Having Jurisdiction. The Authority Having Jurisdiction for fire safety will present University’s Project Manager with a written summary of the findings who will then take these issues to the Contractor’s superintendent, foreman or other designated representative and return the summary form with documentation of the resolution of safety items to AHJ. Abate deficient items in a timely manner. Include documentation and resolution of safety items presented in weekly Progress Meeting minutes. Inspections by University AHJ are spot-checks only. They are not all encompassing. These inspections and recommendations do not relieve the Contractor from obligations related to safe work practices, as required under federal law.
e. AHJ has the right to access the site at all times. Should a potential threat to personnel or property be observed, AHJ may require the hazard related operation immediately altered until adequate safeguards are addressed.
f. Supply AHJ, through the University Project Manager, with a copy of Contractor’s weekly safety meeting minutes and safety inspection reports.
g. Provide signs used for proper identification of construction areas.
h. Provide adequate number of appropriately rated fire extinguishers to be available on-site for emergency use in the construction area.
i. Insure standpipes, pull stations, electrical panels, water control valves and fire hydrants are accessible at all times.
j. Post emergency notification phone numbers provided by Contractor and University in all construction areas.
k. Notify University Project Manager of any lost time injuries occurring on University’s property within one (1) calendar day and of any fatalities immediately.
l. Submit copies of all injury reports to AHJ, through University’s Project Manager.
m. Equip construction personnel with personal protective equipment (PPE) where required. Coordinate with University Project Manager to identify where use of PPE will be required.

B. OSHA Hazard Communication Standard:

1. Every Contractor and Subcontractor performing work shall to comply with the OSHA Hazard Communication Standard. Compliance includes joint University and Contractor responsibilities for the purpose of providing timely communications and information sharing with regard to hazardous materials, chemicals and chemical sources which may be present on-site or brought in by Contractor.

2. University Project Manager will provide Contractor with the following:

   a. Information regarding known hazardous chemicals and agents or other hazards present at the job site.
   b. University emergency procedures and contact numbers.

3. Provide safety training and environmental surveillance of all workers.

4. Inform and provide University’s Project Manager the following:

   a. Material safety data sheets (MSDS) for all chemicals introduced into the workplace.
   b. Information regarding potential sources of pollutants which may be entrained in University’s air intakes, e.g., roofing tar fumes, nuisance dusts, exhaust from internal combustion engines, welding or cutting fumes, and asbestos - if damaged or encountered during the course of the work.

C. Asbestos and Lead Paint:

1. The presence of asbestos-containing materials and/or paint containing lead on the job site does not mean a problem exists. Areas where asbestos is friable and not contained or lead paint is present or will be caused to be present in airborne or settled dust are of concern.
2. Responsibilities of University and Contractor regarding asbestos and lead paint are as follows:

   a. University:

   1) Notify the Contractor of the condition and location(s) where asbestos is known to be present or may reasonably be encountered, e.g., asbestos insulation, ceiling tiles, floor tiles, fire doors, wall and ceiling plasters, concrete, grouting, etc., and lead paint on metal building materials, walls, windows, etc.

   2) Coordinate with Contractor when response action is required by a Subcontractor.

   3) Contract with third party contractor to monitor areas where friable asbestos and/or lead-containing particles are present during construction/renovation projects for its own records and purpose. Monitoring results can be shared with Contractors but are in no way to be used for Contractor employee monitoring.

   4) Final authority on all asbestos-related concerns and contractual arrangements.

   b. Contractor:

   1) Notify University's Project Manager of any suspected or existing problem involving asbestos or lead and cease work in that area until University has assessed the situation.

   2) Ensure that undamaged asbestos-containing material and/or material containing lead, not included in the scope of the project, are not damaged.

   3) Train and monitor their own employees, including Asbestos Awareness training and Lead Paint Awareness training, where applicable.

   4) Be responsible for all environmental/industrial hygiene surveillance of its work staff and subcontractors and for required area monitoring where potential contamination of adjacent areas exists.

   5) Prevent problems which can result in asbestos or lead exposure to building occupants.

   6) Coordinate with the University’s EHS Department and Building Maintenance and Operations through University’s Project Manager and perform all activities that may potentially disturb asbestos containing materials in a manner acceptable to the EHS.

   7) Follow State of Colorado regulation, Emission Standards for Asbestos, Part B, Control of Asbestos, “Regulation 8” and OSHA standards regulating exposure to asbestos and lead.

   8) Where applicable, comply with Section 02 81 00 “Transportation/Disposal of Hazardous Materials.”


D. Carcinogens:

   1. Contractor or any Subcontractor shall not knowingly install or cause to be installed any material or product containing carcinogens. Refer to Annual Report on Carcinogens, U.S. Department of Health and Human Services, National toxicology Program.

E. Hazardous Waste:

   1. All hazardous wastes are to be handled and disposed of according to current EPA and CDPHE guidelines which can be obtained through University Project Manager. Only individuals specifically authorized by University may sign hazardous waste manifests for wastes generated on University’s property. Only University approved transporters and disposal facilities are to be used for transportation and disposal of hazardous wastes.
F. The Control of Hazardous Energy (Lockout/Tagout):
   1. Provide and enforce a program and procedures for the control of hazardous energy (lockout/tagout) including, but not limited to, locks, tags and lockout devices. Provide proof that workers have received safety training in the control of hazardous energy through lockout/tagout.

G. Hot Work Operations:
   1. Comply with University hot work policy and obtain Hot Work Permit prior to executing any hot work in existing buildings.
   2. Notify University Project Manager prior to any hot work on University property.
   3. Provide and enforce a program to control fires during hot work operations. Provide appropriately rated fire extinguishers, fire retardant protective covers (when needed), and any other hot work related equipment.

H. Confined Space Entry:
   1. Work in compliance with the “Confined Spaced Entry Procedure for Non-University Personnel” whenever any project requires entry into a confined space. A copy of this procedure can be obtained from University EHS through University’s Project Manager.

I. Green Tagging of Work Area:
   1. Obtain a Green Tag and Construction Permit from the University Project Manager prior to any work being conducted in a laboratory or on any exhaust ductwork system serving a laboratory. If a Green Tag has been issued, it will be displayed at the entry of the laboratory area. The Green Tag assures that any radioactive, chemical or biological materials have been removed from the laboratory verifying the area is free from hazards to workers. If a Green Tag is not displayed, coordinate tagging with EHS through University’s Project Manager.

END OF SECTION 01 35 44
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 E 2114.

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-resistive 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.

END OF SECTION 01 35 46
Indoor Air Quality Plan
December 13, 2017

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 furnishing, 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.
Planning Checklist
(Must be completed weekly)

Project _________________________________________________________________
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
   - □ 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
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
December 13, 2017

Inspection Checklist
(Must be completed weekly)

Project _________________________________________________________________
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 ducts 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)
PART 1 - GENERAL

1.1 SUMMARY

   A. Section Includes:

      1. Procedures for establishing existing conditions and monitoring procedures for protection of adjacent or nearby structures and improvements including, but not limited to, sidewalks, landscaping, parking facilities, roadways, or driveways, whether on or off the University's property.

   1.2 UNIVERSITY'S SURVEY

      A. University has obtained visual inspections of adjacent and nearby buildings together with photographic records showing details and conditions. This survey was made on <Insert Date> and the photographs are dated and certified by the photographer as of that date. One set of these data is available for Contractor's use and records.

   1.3 SUBMITTALS

      A. Submit photographs and survey data from same points as original, certified and dated by photographer and taken upon completion.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 MONITORING

   A. Establish accurate levels and positions of all elements relative to other fixed points to permit accurate monitoring of potential changes.

   B. At all times during construction activities which are likely to affect adjacent properties, improvements or building, monitor conditions carefully including horizontal or vertical movements, changes in existing cracks, joints or defects or development of new cracks and other evidence of changing conditions. Report immediately to University's Project Manager and Architect/Engineer any changes to existing conditions and stop work where such appear to be significant or potentially dangerous to persons or property.

3.2 REMEDIES
A. Conduct construction operations and specifically [excavation] [caisson drilling] [sheet piling] [underpinning] [shoring] <Insert other relevant construction operation> in a manner that will avoid damage to adjacent buildings, structures, properties or improvements. Promptly remedy any such damage whether to University's or other property and hold the University harmless from such damage.

3.3 POST-CONSTRUCTION SURVEY

A. Within 30 calendar days of completion of those construction activities that would potentially damage adjacent or nearby properties, re-survey all items of University's original survey and Contractor's supplemental information, including monitoring control points. Perform this work using a licensed surveyor and independent photographer. Identify specifically each changed condition, its magnitude and probable cause.

END OF SECTION 01 35 96
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. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities
of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. As indicated in individual Specifications Sections or on the Drawings, the Work may include the following types of mockups:
   a. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
   b. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
   c. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

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

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

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

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

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

A. Shop Drawings: Where integrated exterior mockups are required and indicated on the Drawings, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect/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.
QUALITY REQUIREMENTS

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.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect/Engineer.
2. Notify Architect/Engineer seven calendar days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect/Engineer's approval of mockups before starting work, fabrication, or construction.
   a. Allow seven calendar days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed unless otherwise indicated.
L. Integrated Exterior Mockups: When indicated on Drawings, construct integrated exterior mockup. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

M. Room Mockups: When indicated on Drawings, construct room mockups incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable Architect/Engineer to evaluate quality of the Work. Provide room mockups of the following rooms:

N. Laboratory Mockups: When required by individual Specification Sections, comply with requirements of preconstruction testing and those specified in individual Specification Sections.

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. Asphalctic 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 of Aurora.

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 the 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. The University has a non-standard MS4 permit for entire Anschutz Medical Campus (AMC) that requires University over-sight of campus construction and its water quality impact. Contractors are required to prepare Storm Water Quality Plans and obtain State of Colorado CDPHE permits for all projects that impact site. In addition, Contractors shall comply with the University MS4 permit requirements, including keeping written record of weekly inspections of Storm Water Quality measures and attaching record to the weekly Progress Meeting minutes. Submit the plan, permits, and evidence of final closeout to University Project Manager who will copy all such storm water documents to University Engineering Department. Coordinate with University Project Manager who will arrange for University Grounds Manager to attend monthly inspections and closeout walk.

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


19. OSHA “Occupational Safety and Health Standards” (29 CRF 1910).


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


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
SECTION 01 42 00

REFERENCES

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

H. “General Requirements”: Provisions and requirements of all Division 01 Sections as they apply to all aspects of the Work.

I. “Guarantee”: The narrow definition of the term “warranty” applying to both “warranty” and “guarantee” which terms are used interchangeably.

J. "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."

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

L. "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.

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

N. "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.

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

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

Q. “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.

R. "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.

S. “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.

AABC  Associated Air Balance Council  (202) 737-0202
www.aabc.com

AAMA  American Architectural Manufacturers Association  (847) 303-5664
www.aamanet.org

AASHTO  American Association of State Highway and Transportation Officials  (202) 624-5800
www.transportation.org

AATCC  American Association of Textile Chemists and Colorists  (919) 549-8141
www.aatcc.org

ABMA  American Bearing Manufacturers Association  (202) 367-1155
www.americanbearings.org

ACI  American Concrete Institute
(Formerly: ACI International)  (248) 848-3700
www.concrete.org
ACPA  American Concrete Pipe Association  www.concrete-pipe.org (972) 506-7216

AEIC  Association of Edison Illuminating Companies, Inc. (The)  www.aeic.org (205) 257-2530

AF&PA  American Forest & Paper Association  www.afandpa.org (800) 878-8878 (202) 463-2700

AGA  American Gas Association  www.aga.org (202) 824-7000

AHAM  Association of Home Appliance Manufacturers  www.aham.org (202) 872-5955

AHRI  Air-Conditioning, Heating, and Refrigeration Institute (The)  www.ahrinet.org (703) 524-8800

AI  Asphalt Institute  www.asphaltinstitute.org (859) 288-4960

AIA  American Institute of Architects (The)  www.aia.org (800) 242-3837 (202) 626-7300

AISC  American Institute of Steel Construction  www.aisc.org (800) 644-2400 (312) 670-2400

AISI  American Iron and Steel Institute  www.steel.org (202) 452-7100

AITC  American Institute of Timber Construction  www.aitc-glulam.org (303) 792-9559


ANSI  American National Standards Institute  www.ansi.org (202) 293-8020

AOSA  Association of Official Seed Analysts, Inc.  www.aosaseed.com (607) 256-3313

APA  APA - The Engineered Wood Association  www.apawood.org (253) 565-6600

APA  Architectural Precast Association  www.archprecast.org (239) 454-6989

API  American Petroleum Institute  www.api.org (202) 682-8000

ARI  Air-Conditioning & Refrigeration Institute  (See AHRI)
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<th>Organization</th>
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<td>ARI</td>
<td>American Refrigeration Institute (See AHRI)</td>
<td><a href="http://www.arma.org">www.arma.org</a></td>
<td>(202) 207-0917</td>
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<td>ARMA</td>
<td>Asphalt Roofing Manufacturers Association</td>
<td><a href="http://www.asphaltroofing.org">www.asphaltroofing.org</a></td>
<td>(800) 548-2723</td>
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<tr>
<td>ASCE</td>
<td>American Society of Civil Engineers</td>
<td><a href="http://www.asce.org">www.asce.org</a></td>
<td>(703) 295-6300</td>
</tr>
<tr>
<td>ASCE/SEI</td>
<td>American Society of Civil Engineers/Structural Engineering Institute (See ASCE)</td>
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<td>ASHRAE</td>
<td>American Society of Heating, Refrigerating and Air-Conditioning Engineers</td>
<td><a href="http://www.ashrae.org">www.ashrae.org</a></td>
<td>(800) 527-4723</td>
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<tr>
<td>ASME</td>
<td>ASME International (American Society of Mechanical Engineers)</td>
<td><a href="http://www.asme.org">www.asme.org</a></td>
<td>(800) 843-2763</td>
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<td>(973) 882-1170</td>
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<td>ASSE</td>
<td>American Society of Safety Engineers (The)</td>
<td><a href="http://www.asse.org">www.asse.org</a></td>
<td>(847) 699-2929</td>
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<td>ASSE</td>
<td>American Society of Sanitary Engineering</td>
<td><a href="http://www.asse-plumbing.org">www.asse-plumbing.org</a></td>
<td>(440) 835-3040</td>
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<td>ATIS</td>
<td>Alliance for Telecommunications Industry Solutions</td>
<td><a href="http://www.atis.org">www.atis.org</a></td>
<td>(202) 628-6380</td>
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<td>AWEA</td>
<td>American Wind Energy Association</td>
<td><a href="http://www.awea.org">www.awea.org</a></td>
<td>(202) 383-2500</td>
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<td>AWI</td>
<td>Architectural Woodwork Institute</td>
<td><a href="http://www.awinet.org">www.awinet.org</a></td>
<td>(571) 323-3636</td>
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<td>AWMAC</td>
<td>Architectural Woodwork Manufacturers Association of Canada</td>
<td><a href="http://www.awmac.com">www.awmac.com</a></td>
<td>(403) 453-7387</td>
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<td>AWPA</td>
<td>American Wood Protection Association (Formerly: American Wood-Preservers' Association)</td>
<td><a href="http://www.awpa.com">www.awpa.com</a></td>
<td>(205) 733-4077</td>
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<td>AWS</td>
<td>American Welding Society</td>
<td><a href="http://www.aws.org">www.aws.org</a></td>
<td>(800) 443-9353</td>
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<td>(305) 443-9353</td>
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<td>AWWA</td>
<td>American Water Works Association</td>
<td><a href="http://www.awwa.org">www.awwa.org</a></td>
<td>(800) 926-7337</td>
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<td>(303) 794-7711</td>
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<td>BHMA</td>
<td>Builders Hardware Manufacturers Association</td>
<td><a href="http://www.buildershardware.com">www.buildershardware.com</a></td>
<td>(212) 297-2122</td>
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<td>Acronym</td>
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<td>BIA</td>
<td>Brick Industry Association (The)</td>
<td>(703) 620-0010</td>
<td><a href="http://www.gobrick.com">www.gobrick.com</a></td>
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<td>BICSI</td>
<td>BICSI, Inc.</td>
<td>(800) 242-7405</td>
<td><a href="http://www.bicsi.org">www.bicsi.org</a></td>
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<td>BIFMA</td>
<td>BIFMA International (Business and Institutional Furniture Manufacturer's Association)</td>
<td>(616) 285-3963</td>
<td><a href="http://www.bifma.com">www.bifma.com</a></td>
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<tr>
<td>BISSC</td>
<td>Baking Industry Sanitation Standards Committee</td>
<td>(866) 342-4772</td>
<td><a href="http://www.bissc.org">www.bissc.org</a></td>
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<td>BOCA</td>
<td>BOCA (Building Officials and Code Administrators International Inc.)</td>
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<td>BWF</td>
<td>Badminton World Federation (Formerly: International Badminton Federation)</td>
<td>603 9283 7155</td>
<td><a href="http://www.bwrbadminton.org">www.bwrbadminton.org</a></td>
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<td>CDA</td>
<td>Copper Development Association</td>
<td>(800) 232-3282</td>
<td><a href="http://www.copper.org">www.copper.org</a></td>
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<td>CEA</td>
<td>Canadian Electricity Association</td>
<td>(613) 230-9263</td>
<td><a href="http://www.electricity.ca">www.electricity.ca</a></td>
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<tr>
<td>CEA</td>
<td>Consumer Electronics Association</td>
<td>(866) 858-1555</td>
<td><a href="http://www.electro.ca">www.electro.ca</a></td>
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<td>CFFA</td>
<td>Chemical Fabrics &amp; Film Association, Inc.</td>
<td>(216) 241-7333</td>
<td><a href="http://www.chemicalfabricsandfilm.com">www.chemicalfabricsandfilm.com</a></td>
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<td>CFSEI</td>
<td>Cold-Formed Steel Engineers Institute</td>
<td>(866) 465-4732</td>
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<td>CGA</td>
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<td>(703) 788-2700</td>
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<td>CIMA</td>
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<td>(888) 881-2462</td>
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<td>CISCA</td>
<td>Ceilings &amp; Interior Systems Construction Association</td>
<td>(630) 584-1919</td>
<td><a href="http://www.cisca.org">www.cisca.org</a></td>
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<td>CISPI</td>
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<td>(404) 622-0073</td>
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<td>CLFMI</td>
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<td>(301) 596-2583</td>
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<td>CPA</td>
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<td>(703) 724-1128</td>
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<td>CRI</td>
<td>Carpet and Rug Institute (The)</td>
<td>(706) 278-3176</td>
<td><a href="http://www.carpet-rug.org">www.carpet-rug.org</a></td>
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<td>Cool Roof Rating Council</td>
<td>(866) 465-2523, (510) 485-7175</td>
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<td>CRSI</td>
<td>Concrete Reinforcing Steel Institute</td>
<td>(800) 328-6306, (847) 517-1200</td>
<td><a href="http://www.crsi.org">www.crsi.org</a></td>
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<td>CSA</td>
<td>Canadian Standards Association</td>
<td>(800) 463-6727, (416) 747-4000</td>
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<td>CSA</td>
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<td>CSI</td>
<td>Construction Specifications Institute (The)</td>
<td>(800) 689-2900, (703) 684-0300</td>
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<td>CSSB</td>
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<td>(604) 820-7700</td>
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<td>CTI</td>
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<td>(281) 583-4087</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>
<td>Door and Hardware Institute</td>
<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>
<td><a href="http://www.ec-central.org">www.ec-central.org</a></td>
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<td>ECAMA</td>
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<td>EIMA</td>
<td>EIFS Industry Members Association</td>
<td>(800) 294-3462, (703) 538-1616</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</td>
<td>(315) 339-6937</td>
<td>(Electrostatic Discharge Association) <a href="http://www.esda.org">www.esda.org</a></td>
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<td>ESTA</td>
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<td>EVO</td>
<td>Efficiency Valuation Organization</td>
<td>(415) 367-3643, 44 20 88 167 857</td>
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<td>Fédération Internationale de Basketball (The International Basketball Federation)</td>
<td>41 22 545 00 00</td>
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<td>41 21 345 35 45</td>
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<td>FM Approvals</td>
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<td>(781) 762-4300</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>
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<td><a href="http://www.floridaroof.com">www.floridaroof.com</a></td>
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<td>(610) 971-4850</td>
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<td>FSC</td>
<td>Forest Stewardship Council U.S.</td>
<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><a href="http://www.glasswebsite.com">www.glasswebsite.com</a></td>
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<td>GS</td>
<td>Green Seal</td>
<td>(202) 872-6400</td>
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<td>HI</td>
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<td>HPVA</td>
<td>Hardwood Plywood &amp; Veneer Association</td>
<td>(703) 435-2900</td>
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<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>
<td>International Association of Professional Security Consultants</td>
<td>(415) 536-0288</td>
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<td>IAS</td>
<td>International Approval Services (See CSA)</td>
<td>(888) 422-7233</td>
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<td>ICBO</td>
<td>International Conference of Building Officials (See ICC)</td>
<td>(202) 370-1800</td>
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<td>ICC</td>
<td>International Code Council</td>
<td>(770) 830-0369</td>
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<td>ICEA</td>
<td>Insulated Cable Engineers Association, Inc.</td>
<td>(703) 525-0511</td>
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<td>International Cast Polymer Alliance</td>
<td>(847) 827-0830</td>
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<td>ICRI</td>
<td>International Concrete Repair Institute, Inc.</td>
<td>(212) 419-7900</td>
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<td>IEC</td>
<td>International Electrotechnical Commission</td>
<td>(212) 248-5000</td>
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<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers, Inc. (The)</td>
<td>(212) 419-7900</td>
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<td>IES</td>
<td>Illuminating Engineering Society (Formerly: Illuminating Engineering Society of North America)</td>
<td>(212) 981-0100</td>
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<td>IESNA</td>
<td>Illuminating Engineering Society of North America (See IES)</td>
<td>(613) 233-1510</td>
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<td>IEST</td>
<td>Institute of Environmental Sciences and Technology</td>
<td>(812) 275-4426</td>
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<td>IGMA</td>
<td>Insulating Glass Manufacturers Alliance</td>
<td>(800) 967-5352</td>
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<td>IGSHPA</td>
<td>International Ground Source Heat Pump Association</td>
<td>(919) 549-8411</td>
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<td>Intertek</td>
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ISFA  International Surface Fabricators Association  (Formerly: International Solid Surface Fabricators Association)  
    www.isfanow.org  

ISO  International Organization for Standardization  
    www.iso.org  

ISSFA  International Solid Surface Fabricators Association  (See ISFA)  

ITU  International Telecommunication Union  
    www.itu.int/home  

KCMA  Kitchen Cabinet Manufacturers Association  
    www.kcma.org  

LMA  Laminating Materials Association  (See CPA)  

LPI  Lightning Protection Institute  
    www.lightning.org  

MBMA  Metal Building Manufacturers Association  
    www.mbma.com  

MCA  Metal Construction Association  
    www.metalconstruction.org  

MFMA  Maple Flooring Manufacturers Association, Inc.  
    www.maplefloor.org  

MFMA  Metal Framing Manufacturers Association, Inc.  
    www.metalframingmfg.org  

MHIA  Material Handling Industry of America  
    www.mhia.org  

MIA  Marble Institute of America  
    www.marble-institute.com  

MMPA  Moulding & Millwork Producers Association  
    (Formerly: Wood Moulding & Millwork Producers Association)  
    www.wmmpa.com  

MPI  Master Painters Institute  
    www.paintinfo.com  

MSS  Manufacturers Standardization Society of The Valve and Fittings Industry Inc.  
    www.mss-hq.org  

NAAMM  National Association of Architectural Metal Manufacturers  
    www.naamm.org  

REFERENCES
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<td>(800) 797-6223, (281) 228-6200</td>
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<td>NADCA</td>
<td>National Air Duct Cleaners Association</td>
<td><a href="http://www.nadca.com">www.nadca.com</a></td>
<td>(202) 737-2926</td>
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<td>NAIMA</td>
<td>North American Insulation Manufacturers Association</td>
<td><a href="http://www.naima.org">www.naima.org</a></td>
<td>(703) 684-0084</td>
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<td>NBGQA</td>
<td>National Building Granite Quarries Association, Inc.</td>
<td><a href="http://www.nbgqa.com">www.nbgqa.com</a></td>
<td>(800) 557-2848</td>
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<td>NCAA</td>
<td>National Collegiate Athletic Association (The)</td>
<td><a href="http://www.ncaa.org">www.ncaa.org</a></td>
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<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>
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<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>
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<td>NECA</td>
<td>National Electrical Contractors Association</td>
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<td>NeLMA</td>
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<td>(207) 829-6901</td>
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<td>NEMA</td>
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<td>NETA</td>
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<td><a href="http://www.netaworld.org">www.netaworld.org</a></td>
<td>(888) 300-6382, (269) 488-6382</td>
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<td>NFHS</td>
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<td>(800) 344-3555, (617) 770-3000</td>
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<td>(301) 589-1776</td>
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<td>NHLA</td>
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<td><a href="http://www.nhla.com">www.nhla.com</a></td>
<td>(800) 933-0318, (901) 377-1818</td>
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<td>(604) 524-2393</td>
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<td>NRCA</td>
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<td>NRMCA</td>
<td>National Ready Mixed Concrete Association</td>
<td>(888) 846-7622</td>
<td><a href="http://www.nrmca.org">www.nrmca.org</a></td>
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<td>NSF</td>
<td>NSF International (National Sanitation Foundation International)</td>
<td>(800) 673-6275</td>
<td><a href="http://www.nsf.org">www.nsf.org</a></td>
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<td>NSPE</td>
<td>National Society of Professional Engineers</td>
<td>(703) 684-2800</td>
<td><a href="http://www.nspe.org">www.nspe.org</a></td>
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<td>NSSGA</td>
<td>National Stone, Sand &amp; Gravel Association</td>
<td>(800) 342-1415</td>
<td><a href="http://www.nssga.org">www.nssga.org</a></td>
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<td>NTMA</td>
<td>National Terrazzo &amp; Mosaic Association, Inc. (The)</td>
<td>(800) 323-9736</td>
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<td>NWFA</td>
<td>National Wood Flooring Association</td>
<td>(800) 422-4556</td>
<td><a href="http://www.nwfa.org">www.nwfa.org</a></td>
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<td>PCI</td>
<td>Precast/Prestressed Concrete Institute</td>
<td>(312) 786-0300</td>
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<td>PDI</td>
<td>Plumbing &amp; Drainage Institute</td>
<td>(800) 589-8956</td>
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<td>PLASA</td>
<td>PLASA (Formerly: ESTA - Entertainment Services and Technology Association)</td>
<td>(212) 244-1505</td>
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<td>RCSC</td>
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<td>RFCI</td>
<td>Resilient Floor Covering Institute</td>
<td>(706) 882-3833</td>
<td><a href="http://www.rfci.com">www.rfci.com</a></td>
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<td>RIS</td>
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<td>(925) 935-1499</td>
<td><a href="http://www.redwoodinspection.com">www.redwoodinspection.com</a></td>
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<td>SAE</td>
<td>SAE International (Society of Automotive Engineers)</td>
<td>(877) 606-7323</td>
<td><a href="http://www.sae.org">www.sae.org</a></td>
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<td>Southern Building Code Congress International, Inc. (See ICC)</td>
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<td><a href="http://www.sdi.org">www.sdi.org</a> (847) 458-4647</td>
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<td>SDI Steel Door Institute</td>
<td><a href="http://www.steeldoor.org">www.steeldoor.org</a> (440) 899-0010</td>
</tr>
<tr>
<td>SEFA Scientific Equipment and Furniture Association</td>
<td><a href="http://www.sefalabs.com">www.sefalabs.com</a> (877) 294-5424</td>
</tr>
<tr>
<td>SEI/ASCE Structural Engineering Institute/American Society of Civil Engineers</td>
<td>(See ASCE)</td>
</tr>
<tr>
<td>SIA Security Industry Association</td>
<td><a href="http://www.siaonline.org">www.siaonline.org</a> (866) 817-8888 (703) 683-2075</td>
</tr>
<tr>
<td>SJI Steel Joist Institute</td>
<td><a href="http://www.steeljoist.org">www.steeljoist.org</a> (843) 293-1995</td>
</tr>
<tr>
<td>SMA Screen Manufacturers Association</td>
<td><a href="http://www.smainfo.org">www.smainfo.org</a> (773) 636-0672</td>
</tr>
<tr>
<td>SMACNA Sheet Metal and Air Conditioning Contractors' National Association</td>
<td><a href="http://www.smacna.org">www.smacna.org</a> (703) 803-2980</td>
</tr>
<tr>
<td>SMPTE Society of Motion Picture and Television Engineers</td>
<td><a href="http://www.smpte.org">www.smpte.org</a> (914) 761-1100</td>
</tr>
<tr>
<td>SPFA Spray Polyurethane Foam Alliance</td>
<td><a href="http://www.sprayfoam.org">www.sprayfoam.org</a> (800) 523-6154</td>
</tr>
<tr>
<td>SPIB Southern Pine Inspection Bureau</td>
<td><a href="http://www.spib.org">www.spib.org</a> (850) 434-2611</td>
</tr>
<tr>
<td>SPRI Single Ply Roofing Industry</td>
<td><a href="http://www.spri.org">www.spri.org</a> (781) 647-7026</td>
</tr>
<tr>
<td>SSINA Specialty Steel Industry of North America</td>
<td><a href="http://www.ssina.com">www.ssina.com</a> (800) 982-0355 (202) 342-8630</td>
</tr>
<tr>
<td>SSPC SSPC: The Society for Protective Coatings</td>
<td><a href="http://www.sspc.org">www.sspc.org</a> (877) 281-7772 (412) 281-2331</td>
</tr>
<tr>
<td>STI Steel Tank Institute</td>
<td><a href="http://www.steeltank.com">www.steeltank.com</a> (847) 438-8265</td>
</tr>
<tr>
<td>SWI Steel Window Institute</td>
<td><a href="http://www.steelwindows.com">www.steelwindows.com</a> (216) 241-7333</td>
</tr>
<tr>
<td>SWPA Submersible Wastewater Pump Association</td>
<td><a href="http://www.swpa.org">www.swpa.org</a> (847) 681-1868</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>TCA</td>
<td>Tilt-Up Concrete Association</td>
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<tr>
<td>TCNA</td>
<td>Tile Council of North America, Inc.</td>
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<tr>
<td>TEMA</td>
<td>Tubular Exchanger Manufacturers Association, Inc.</td>
</tr>
<tr>
<td>TIA</td>
<td>Telecommunications Industry Association (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance)</td>
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<tr>
<td>TIA/EIA</td>
<td>Telecommunications Industry Association/Electronic Industries Alliance (See TIA)</td>
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<tr>
<td>TMS</td>
<td>The Masonry Society</td>
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<tr>
<td>TPI</td>
<td>Truss Plate Institute</td>
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<td>TPI</td>
<td>Turfgrass Producers International</td>
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<tr>
<td>TRI</td>
<td>Tile Roofing Institute</td>
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<tr>
<td>UBC</td>
<td>Uniform Building Code (See ICC)</td>
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<td>UL</td>
<td>Underwriters Laboratories Inc.</td>
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<tr>
<td>UNI</td>
<td>Uni-Bell PVC Pipe Association</td>
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<tr>
<td>USAV</td>
<td>USA Volleyball</td>
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<tr>
<td>USGBC</td>
<td>U.S. Green Building Council</td>
</tr>
<tr>
<td>USITT</td>
<td>United States Institute for Theatre Technology, Inc.</td>
</tr>
<tr>
<td>WASTEC</td>
<td>Waste Equipment Technology Association</td>
</tr>
<tr>
<td>WCLIB</td>
<td>West Coast Lumber Inspection Bureau</td>
</tr>
</tbody>
</table>
WCMA  Window Covering Manufacturers Association  (212) 297-2122
www.wcmanet.org

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

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

WMMPA  Wood Moulding & Millwork Producers Association  (See MMPA)

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

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

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

REFERENCES
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.

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name</th>
<th>Address/Website</th>
<th>Phone</th>
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<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
<td><a href="http://www.epa.gov">www.epa.gov</a></td>
<td>(202) 272-0167</td>
</tr>
<tr>
<td>FAA</td>
<td>Federal Aviation Administration</td>
<td><a href="http://www.faa.gov">www.faa.gov</a></td>
<td>(866) 835-5322</td>
</tr>
<tr>
<td>GSA</td>
<td>General Services Administration</td>
<td><a href="http://www.gsa.gov">www.gsa.gov</a></td>
<td>(800) 488-3111</td>
</tr>
<tr>
<td>HUD</td>
<td>Department of Housing and Urban Development</td>
<td><a href="http://www.hud.gov">www.hud.gov</a></td>
<td>(202) 708-1112</td>
</tr>
<tr>
<td>LBL</td>
<td>Lawrence Berkeley National Laboratory</td>
<td><a href="http://www.lbl.gov">www.lbl.gov</a></td>
<td>(510) 486-4000</td>
</tr>
<tr>
<td>OSHA</td>
<td>Occupational Safety &amp; Health Administration</td>
<td><a href="http://www.osha.gov">www.osha.gov</a></td>
<td>(800) 321-6742</td>
</tr>
<tr>
<td>SD</td>
<td>Department of State</td>
<td><a href="http://www.state.gov">www.state.gov</a></td>
<td>(202) 647-4000</td>
</tr>
<tr>
<td>TRB</td>
<td>Transportation Research Board</td>
<td><a href="http://www.trb.org">www.trb.org</a></td>
<td>(202) 334-2934</td>
</tr>
<tr>
<td>USDA</td>
<td>Department of Agriculture</td>
<td><a href="http://www.usda.gov">www.usda.gov</a></td>
<td>(202) 279-2791</td>
</tr>
<tr>
<td>USDA</td>
<td>Agriculture Research Service</td>
<td><a href="http://www.ars.usda.gov">www.ars.usda.gov</a></td>
<td>(202) 720-3656</td>
</tr>
<tr>
<td>USDA</td>
<td>Rural Utilities Service</td>
<td><a href="http://www.usda.gov">www.usda.gov</a></td>
<td>(202) 720-2791</td>
</tr>
<tr>
<td>USDJ</td>
<td>Department of Justice</td>
<td><a href="http://www.ojp.usdoj.gov">www.ojp.usdoj.gov</a></td>
<td>(202) 307-0703</td>
</tr>
<tr>
<td>USP</td>
<td>U.S. Pharmacopeia</td>
<td><a href="http://www.usp.org">www.usp.org</a></td>
<td>(800) 227-8772</td>
</tr>
<tr>
<td>USPS</td>
<td>United States Postal Service</td>
<td><a href="http://www.usps.com">www.usps.com</a></td>
<td>(301) 881-0666</td>
</tr>
</tbody>
</table>

REFERENCES
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: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Insulated, weather-tight, of sufficient size to accommodate needs of University, Architect/Engineer, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly.

1. At a minimum, furnish and equip offices as follows:
   a. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
   b. Conference room of sufficient size to accommodate meetings of [10] individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
   c. Drinking water and private toilet.
   d. Coffee machine and supplies.
   e. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
   f. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.
2. Comply with Section 01 10 00 “Summary” for use of site for staging areas.

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.

C. Thermometer: Outdoor, re-settable type indicating daily maximum and minimum temperatures.

1. Locate in a shaded-from-the-sun, conveniently readable location that will give reasonably accurate readings of the actual air temperature and be reached easily for resetting.

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate, 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. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction. Where available, connect to University's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to University. At Substantial Completion, restore these facilities to condition existing before initial use.

1. Obtain and pay for all required water taps.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Toilets: Use of University's existing toilet facilities is not permitted.
2. Provide temporary toilets within available site area in location approved by University which will best serve the needs of construction personnel.
3. 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.
4. 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).

E. 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. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
   c. 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".

F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
   a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
   b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.

3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

H. Electric Power Service: Provide weatherproof, grounded, electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations. Include, as required, transformers, overload protected disconnects, automatic ground fault interrupters and main distribution switchgear. Maintain equipment in a condition acceptable to University.

1. Install electric power service overhead unless otherwise indicated.
2. Where available capacity exists in existing system, connect temporary service to University's existing power source, as directed by University.
3. Provide separate connection for power and for lighting.
4. Provide sufficient 220v outlets for special tools, welding equipment and similar devices requiring such service at locations where required.
5. Provide sufficient circuits and duplex 120v single phase outlets so located that any part of the work can be reached with a 75 foot extension cord to accommodate normal power tools and supplemental lighting.

I. 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.
5. Provide lighting in stairways and exits at all times.

J. Telephone Service: Provide temporary telephone service in Contractor’s field office and distribute to each work station.

1. Pay for line installation, monthly charges, and expenses necessary to extend service from minimum point of presence (MPOP) as determined by University I/S.
2. Provide temporary telephone service in common-use facilities for use by all construction personnel.
3. Provide answering machine and a dedicated telephone line for a facsimile machine.
4. 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:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect/Engineer schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to University.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Surface temporary access road with road base material of not less than 4 inch thickness and compact.
2. Provide temporary signage and temporary pedestrian accessways or other special considerations necessary for continued University operations.
3. Provide stop sign(s) at all points of egress from construction site to meet standards established in the Manual of Uniform Traffic Code Devices (MUTCD).
4. Maintain University access to areas affected by temporary access roads during inclement weather.
5. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
6. Restore to original condition to satisfaction of University when no longer required.

C. Temporary Walks: Construct and maintain temporary walks around the construction work and to offices, toilets and similar locations on the site.

D. 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.

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

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

G. Project Signs: Provide Project signs at locations indicated or directed. Unauthorized signs are not permitted.

1. Identification Signs: Unless otherwise indicated, provide 4 foot by 8 foot Project identification sign.
   a. Architect/Engineer will provide sign layout, including colors and graphics as approved by University Resident Architect through University Project Manager.
2. 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.
3. Engage an experience sign painter to apply required colors and graphics in a neat and professional manner.
4. Maintain and touchup signs so they are legible at all times.

H. 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. Coordinate with University Project Manager to obtain approval from University Environmental Services Manager.
2. Provide waste chutes as required in accordance with applicable laws and regulations.

I. 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.

J. 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.

K. 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.

L. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

M. 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.

N. 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. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
1. Comply with Section 01 41 00 “Regulatory Requirements” Article “MS4 Storm Water and Water Quality Permits.”
2. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
3. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
4. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
5. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

E. Stormwater Control: Comply with Section 01 41 00 “Regulatory Requirements” Article “MS4 Storm Water and Water Quality Permits.”

F. Tree and Plant Protection: Install temporary fencing or guard located outside the drip line of trees to protect vegetation from damage arising out of construction operations, including cutting, breaking or skinning of roots and skinning or bruising of bark. Protect tree root systems from damage, flooding, and erosion.
1. Do not stockpile construction materials or excavated materials inside dripline.
2. University will identify historically recorded trees and vegetation not to be disturbed.
3. Water trees and other vegetation to remain as required to maintain their health for the duration of the Project.
4. Repair or replace trees and vegetation damaged by construction operations in a manner acceptable to Architect/Engineer. Use a qualified tree surgeon to perform the work.

G. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

H. Site Enclosure Fence: Within 10 business days of mobilization, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates and will protect adjacent sites from damage or contamination.
1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.


3. Locate so base supports do not extend outside work area where adjacent to walkways.

4. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to University.

I. 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.

J. 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.

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

L. Covered Walkway: Where regulations require or where a public roadway/walkway adjoins the Project site and materials may be hoisted across the walkway, erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.

1. Construct covered walkways using scaffold or shoring framing.

2. Provide overhead waterproof decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.

3. Paint and maintain appearance of walkway for duration of the Work in a manner acceptable to the Architect/Engineer and University.

4. Extend back wall beyond structure to complete the enclosure fence.

M. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

2. Coordinate temporary enclosures with ventilating and drying-of-the-work requirements, so as to avoid dangerous conditions and deleterious effects.

3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.

N. 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.

O. 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. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.

E. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

F. 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. **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.
4. Where products are accompanied by the term "as selected," Architect/Engineer will make selection.
6. **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.
CLOSEOUT PROCEDURES

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’s 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.

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.
CLOSEOUT PROCEDURES

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 bonds 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.

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.
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1. 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, refinishing 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:**

**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>
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</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>
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</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>
</tbody>
</table>

19. Training for BMO and FSS on installed equipment and systems is completed.

20. Equipment keys and locks transitioned to Operations, including fire panels, electrical panels, directories and generator panels. Construction cores removed and replaced with permanent cores.

21. Access control pathways and junction boxes for installed doors, gates, loading docks and roof access complete. *All wiring and hardware completed and electronic security access controls in place and tested by University Electronic Security.*

22. EH&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.

23. PM notifies University Risk Management that project is transferring to University and notifies Contractor that it can eliminate Builders Risk Insurance.

24. Not Used

25. Not Used

26. Elevator tools, including hand tools, computer, proprietary and operational software is received and confirm 1-year service from date of acceptance.

27. 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.

28. 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.

29. Water chlorination and testing complete and provided by PM to Chief Building Official and BMO via BMO Rep.

30. Toilet accessories are in place that meet custodial contract.

31. Trash receptacles outside the building are in place

---

University Project Manager  
(sign & print name)  
Date

University BMO Rep.  
(sign & print name)  
Date

University FSS Rep  
(sign & print name)  
Date

University Downtown Rep. (If Necessary)  
(sign & print name)  
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: ____________________________
Contractor: ____________________________

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>
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</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. **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.</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>
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</tr>
<tr>
<td>8. Attic stock, matches spec. requirements, is located in secured location, and is inventoried.</td>
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<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 (sign &amp; print name)</th>
<th>Date</th>
<th>University BMO Rep. (sign &amp; print name)</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>University FSS (sign &amp; print name)</td>
<td>Date</td>
<td>University Downtown Rep (if necessary) (sign &amp; print name)</td>
<td>Date</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
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 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

   1. List of documents.
   2. List of systems.
   3. List of equipment.
   4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."
2.2 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.
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.

2.3 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.
2.4 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.

2.5 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.

2.6 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.
o. 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 78 46

EXTRA STOCK MATERIALS

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 descriptions and quantities of required extra stock materials.

1.3 INFORMATIONAL SUBMITTALS

A. Schedule of Maintenance Materials: Prepare a schedule in tabular form of all extra stock materials required in individual Specification Sections including:

1. Specification Section number and title.
2. Description of required material
3. Quantity of required material.

1.4 MAINTENANCE MATERIALS

A. Furnish extra materials that match and are from the same production runs as the product installed.

B. Provide in the quantities indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 MAINTENANCE MATERIAL SCHEDULE

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>04 42 00</td>
<td>EXTERIOR STONE</td>
<td>Dimension Stone Units</td>
<td>Furnish 100 sq. ft. finished stone panels for each finish and variety of stone specified.</td>
</tr>
<tr>
<td>Code</td>
<td>Division</td>
<td>Description</td>
<td>Specification</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------</td>
<td>-----------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>09 30 00</td>
<td>TILING</td>
<td>Tile and Trim Units</td>
<td>Furnish 100 sq. ft. of full-size units for each type, composition, color, pattern, and size indicated.</td>
</tr>
<tr>
<td>09 30 33</td>
<td>STONE TILING</td>
<td>Dimension Stone Tile</td>
<td>Furnish 100 sq. ft. of full-size units for each type, composition, color, pattern, and size indicated.</td>
</tr>
<tr>
<td>09 51 13</td>
<td>ACOUSTICAL PANEL CEILINGS</td>
<td>Acoustical Ceiling Panels</td>
<td>100 sq. ft. of full-size panels.</td>
</tr>
<tr>
<td>09 51 23</td>
<td>ACOUSTICAL TILE CEILINGS</td>
<td>Acoustical Ceiling Units</td>
<td>100 sq. ft. of full-size tiles.</td>
</tr>
<tr>
<td>09 54 36</td>
<td>SUSPENDED DECORATIVE GRIDS</td>
<td>Suspended Decorative Grids</td>
<td>100 sq. ft. of each suspended decorative grid component, exposed molding, and trim.</td>
</tr>
<tr>
<td>09 62 29</td>
<td>CORK FLOORING</td>
<td>Cork Flooring</td>
<td>Furnish 1 box of each type, shade, pattern, and finish of cork flooring installed.</td>
</tr>
<tr>
<td>09 65 13</td>
<td>RESILIENT BASE AND ACCESSORIES</td>
<td></td>
<td>Furnish 50 linear feet of each type, color, pattern, and size of wall base installed. Furnish 2% of each type, color, pattern, and size of all other resilient accessories installed.</td>
</tr>
<tr>
<td>09 68 13</td>
<td>TILE CARPETING</td>
<td>Carpet Tile</td>
<td>100 sq. ft. of full-size units for each type indicated.</td>
</tr>
<tr>
<td>10 13 00</td>
<td>DIRECTORIES</td>
<td>Message Strips</td>
<td>Full-size, blank strips equal to 10 percent of amount installed for each size indicated, but no fewer than 20 strips.</td>
</tr>
<tr>
<td>11 12 00</td>
<td>PARKING CONTROL EQUIPMENT</td>
<td>Gate Arms</td>
<td>1 breakaway gate arms for each gate installed, complete with accessory components.</td>
</tr>
<tr>
<td>12 21 13</td>
<td>HORIZONTAL LOUVER BLINDS</td>
<td>Horizontal Louver Blinds</td>
<td>Full-size units equal to 1 percent of quantity installed for each size, color, texture, pattern, and gloss indicated, but no fewer than two units and no more than five units.</td>
</tr>
<tr>
<td>14 20 00</td>
<td>ELEVATORS</td>
<td></td>
<td>2 sets of complete parts catalogs including manufacturer’s recommended spare parts list with clear identification and illustration of each functional part, exploded parts views, identification of part numbers and assembly numbers including replaceable electrical and electronic parts and circuit boards.</td>
</tr>
<tr>
<td>21 05 00</td>
<td>FIRE SUPPRESSION</td>
<td>Sprinkler heads and Special Sprinkler Wrenches.</td>
<td>2 heads minimum of each type and temperature rating installed and special sprinkler wrenches enclosed in a steel cabinet in accordance with NFPA 13.</td>
</tr>
<tr>
<td>22 30 00</td>
<td>PLUMBING EQUIPMENT</td>
<td>Valve Key</td>
<td>1 valve key for each key operated wall hydrant, post hydrant, hose bib, or faucet installed.</td>
</tr>
<tr>
<td>23 05 13</td>
<td>MOTORS</td>
<td>Variable Frequency Drives</td>
<td>1 complete set of spare fuses for each VFD supplied.</td>
</tr>
<tr>
<td>23 30 00</td>
<td>HVAC AIR DISTRIBUTION</td>
<td>Fire Dampers</td>
<td>3 fusible links per type installed.</td>
</tr>
<tr>
<td>23 57 00</td>
<td>HEAT EXCHANGERS FOR HVAC</td>
<td>Heat Exchanger</td>
<td>1 gasket for each flanged connection for each heat exchanger installed.</td>
</tr>
<tr>
<td>Extra Stock Materials</td>
<td>Category</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>23 65 00</td>
<td>COOLING TOWERS</td>
<td>3 spray nozzles for each tower cell provided.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 gasket for each gasketed access and inspection opening provided.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 set of matched fan belts for each belt driven fan provided.</td>
<td></td>
</tr>
<tr>
<td>23 70 00</td>
<td>CENTRAL HVAC EQUIPMENT</td>
<td>Air Handling Units</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 complete set of filters for each air-handling unit installed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 set of belts for each unit installed with label clearly identifying to which fan the belt belongs.</td>
<td></td>
</tr>
<tr>
<td>26 09 43</td>
<td>NETWORK LIGHTING CONTROLS</td>
<td>Control Devices</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 devices for each device used.</td>
<td></td>
</tr>
<tr>
<td>26 20 00</td>
<td>LOW VOLTAGE ELECTRICAL DISTRIBUTION</td>
<td>Fuses</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 set of 3 of each type and size used on the project and fuse cabinet in main electrical room to hold them.</td>
<td></td>
</tr>
<tr>
<td>26 51 00</td>
<td>INTERIOR LIGHTING</td>
<td>Lamps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide 5% or a maximum of 25 spares of each lamp type used on the project.</td>
<td></td>
</tr>
<tr>
<td>28 31 00</td>
<td>FIRE DETECTION AND ALARM</td>
<td>Initiating and Control Devices</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide 5 spare devices for each device type used.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Notification Devices</td>
<td>Provide 5 spare devices for each device type used.</td>
<td></td>
</tr>
</tbody>
</table>

END OF SECTION 01 78 46
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.
1. Required sequences for electric or electronic systems.
2. Special operating instructions and procedures.
3. 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.
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.
3.3 DEMONSTRATION SCHEDULE

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>08 42 29.33</td>
<td>SWINGING AUTOMATIC ENTRANCES</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to adjust, operate, and maintain automatic entrances.</td>
</tr>
<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>10 22 38</td>
<td>OPERABLE PANEL PARTITIONS</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to adjust, operate, and maintain operable panel partitions.</td>
</tr>
<tr>
<td>10 55 00</td>
<td>POSTAL SPECIALTIES</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to adjust, operate, and maintain postal specialties.</td>
</tr>
<tr>
<td>11 12 00</td>
<td>PARKING CONTROL EQUIPMENT</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to adjust, operate, and maintain parking control equipment.</td>
</tr>
<tr>
<td>11 13 00</td>
<td>LOADING DOCK EQUIPMENT</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to adjust, operate, and maintain loading dock equipment.</td>
</tr>
<tr>
<td>11 14 00</td>
<td>FOOD SERVICE EQUIPMENT</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to adjust, operate, and maintain foodservice equipment.</td>
</tr>
<tr>
<td>11 82 26</td>
<td>FACILITY WASTE COMPACTORS</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to adjust, operate, and maintain waste compactors according to manufacturer's requirements and ANSI Z245.2.</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>14 21 00</td>
<td>ELECTRIC TRACTION ELEVATORS</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to operate, adjust, and maintain elevator(s).</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Details</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>14 21 13</td>
<td>ELECTRIC TRACTION FREIGHT ELEVATORS</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to operate, adjust, and maintain elevator(s).</td>
</tr>
<tr>
<td>14 24 00</td>
<td>HYDRAULIC ELEVATORS</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to operate, adjust, and maintain elevator(s).</td>
</tr>
<tr>
<td>14 24 13</td>
<td>HYDRAULIC FREIGHT ELEVATORS</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to operate, adjust, and maintain elevator(s).</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 Anschutz Medical Campus 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-four hour on-site training course and an additional 1-four hour on-site training course per 25,000 sq. ft. for designated University personnel. Provide 40 hours of certified training in Instrument and Controls for every 100,000 sq. ft. of a lab/research building.</td>
</tr>
<tr>
<td>23 11 13</td>
<td>FACILITY FUEL-OIL PIPING</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to adjust, operate, and maintain liquid-level gage systems, leak-detection and monitoring systems, and fuel-oil pumps.</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>Code</td>
<td>Description</td>
<td>Details</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>23 25 13</td>
<td>CHEMICAL WATER TREATEMENT</td>
<td>Engage a factory-authorized service representative to train operating personnel for 8 hours to familiarize them with all treatment equipment and procedures. Include procedure for taking weekly water test on open-loop systems and the application and safe handling of supplied chemicals.</td>
</tr>
<tr>
<td>23 64 16</td>
<td>CENTRIFUGAL WATER CHILLERS</td>
<td>Engage a factory-authorized service representative to train the University’s representative for 4 hours including the operation of chillers, accessories and controls, procedures for startup and shutdown, troubleshooting, servicing, preventative maintenance, and review of the maintenance manuals.</td>
</tr>
<tr>
<td>23 65 00</td>
<td>COOLING TOWERS</td>
<td>Engage a factory-authorized service representative to train the University’s personnel for one, 8-hour day, for operation and maintenance of the cooling towers.</td>
</tr>
<tr>
<td>23 76 00</td>
<td>EVAPORATIVE COOLING EQUIPMENT</td>
<td>Engage the manufacturer’s representative to train the University’s personnel for four (4) hours. Include start-up and shutdown procedures, troubleshooting procedures, and servicing and preventative maintenance schedules and procedures, and the contents of the Operating and Maintenance Data.</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>26 56 00</td>
<td>EXTERIOR LIGHTING</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to adjust, operate, and maintain luminaire lowering devices.</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>
<tr>
<td>32 84 00</td>
<td>PLANTING IRRIGATION</td>
<td>Engage a factory-authorized service representative to train University’s maintenance personnel to adjust, operate, and maintain automatic control valves and controllers.</td>
</tr>
</tbody>
</table>

**END OF SECTION 01 79 00**
SECTION 01 81 13 - SUSTAINABLE DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements:
   1. Comply with State of Colorado High Performance Certification Program (HPCP).
      a. LEED Certification Level: At a minimum, achieve the level required by the HPCP at the
         commencement of the project.
      b. Design building enclosure, building interiors and building systems, and select materials
         consistent with and as required for achievement of the project LEED certification goal,
         including both prerequisites and credits.
   2. LEED Checklist: Prepare a checklist identifying credits to be achieved and demonstrating that the
      design, when complete, will obtain the required LEED certification level.
   3. Pursue Measurement + Verification credit for all buildings.

B. Performance Requirements:
   1. Energy Reduction: Design building to achieve the reduction of energy by cost method based on
      ASHRAE 90.1 required by the HPCP.

1.2 QUALITY ASSURANCE

A. LEED Coordinator: Require Contractor to engage an experienced LEED-Accredited Professional to
   manage the LEED compliance program during construction.

B. LEED Action Plan: Require Contractor to prepare and submit plan identifying strategies for obtaining
   the following credits, as applicable:
   2. Credit MR 3: Salvaged and refurbished materials.
   4. Credit MR 5: Regional materials.
   5. Credit MR 7: Certified wood products.

C. LEED Progress Reports: Require Contractor to provide, with each Application for Payment, a progress
   report comparing construction and purchasing with LEED action plans.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Specify products and procedures necessary to obtain the LEED credits identified in the project LEED
   checklist, considering the following:
   1. Credit MR 3: Salvaged, refurbished or reused materials.
   2. Credit MR 4: Recycled content of material.
   3. Credit MR 5: Regional materials.
   5. Credit IEQ 4: Low-Emitting Materials

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT
A. Credit MR 2: Develop a construction waste management program sufficient to achieve the level indicated in LEED checklist.

3.2 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Credit IEQ 3: Require Contractor to comply with requirements during construction and before occupancy to achieve these credits. Additional construction indoor-air-quality procedures are specified in Section 01 35 46 – Indoor Air Quality Procedures.

END OF SECTION 01 81 13
SECTION 02 81 00 - TRANSPORTATION/DISPOSAL OF HAZARDOUS MATERIAL

PART 1 - GENERAL

1.1 SUMMARY

A. This section provides standards discovery, abatement, disposal, and worker protection for all hazardous materials including asbestos, lead, polychlorinated biphenyls (PCBs), mercury, radioactive materials, and mold.

B. All hazardous materials and waste must be managed and coordinated with Environmental Health and Safety (EHS) through the University Project Manager.

1.2 REFERENCES

A. Occupational Safety and Health Administration, 29 CFR 1926.1101, Asbestos.
C. Environmental Protection Agency, 40 CFR 763.120, Asbestos Worker Protection Rule.
E. Environmental Protection Agency 40 CFR 261.24, Toxicity Characteristic
F. Environmental Protection Agency, 40 CFR 262, Standards Applicable to Generators of Hazardous Waste
H. Code of Colorado Regulation Number 8 Control of Hazardous Air Pollutants, Part B Asbestos Control, 5 CCR 1001 – 10 Part B.
J. Air Quality Control Commission (AQCC) Regulations 19 – Lead-Based Paint Abatement.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Performance Requirements - Asbestos
   1. Presence on Campus:
      a. Asbestos is present in many building in and around the campus. Typical forms of asbestos containing materials (ACM) include pipe insulation, ceiling, wall, floor and roof materials.
      b. Investigate every project where work will occur prior to soil disturbing activities to identify asbestos containing materials (ACM). The University Project Manager is responsible for coordinating and ensuring that an inspection or review of previous surveys and any required sampling be performed prior to finalizing the scope or work and associated budget.
c. Include the cost of investigations, sampling, waste transportation, disposal and associated costs in the cost of the project.

2. Excavation Notifications: Required as described below prior to beginning soil disturbing activities.
   a. Localized Limited Quantity Shallow Hand Digging – No notification required.
   b. Small Scale Localized Hand/Equipment Excavation – No notification required.
   c. Moderate Scale Localized Equipment Excavation – Notification to the University.
   d. Large Scale Equipment Excavation – Notification to the University.

3. Discovery of Asbestos:
   a. Notify contractors and the University Project Manager via project documents to stop work when asbestos is encountered or thought to be encountered. It is the responsibility of the University Project Manager to decide what type of action will follow, in consultation with the University’s EHS Department.

4. Asbestos Removal:
   a. Perform any asbestos removal (abatement), repair, encapsulation or spill clean-up in accordance with the above referenced regulatory standards.
   b. Utilize qualified and trained personnel for abatement design and removal in accordance with the above referenced regulatory standards.

5. Asbestos Containing Waste
   a. Follow the University asbestos waste disposal guidelines and Environmental Protection Agency regulations for disposal of asbestos generated at each project.

B. Performance Requirements – Lead

1. Presence on Campus:
   a. Typical forms of lead containing materials (LCM) include paint, lead shielding materials, electronic equipment, and piping (sink traps).
   b. Consult with EHS through the University Project Manager to determine when LCM investigation is required. The University Project Manager is responsible for coordinating and ensuring that an inspection or review of previous surveys and any required sampling be performed prior to finalizing the scope or work and associated budget.
   c. Include the cost of investigations, sampling, waste transportation, disposal and associated costs in the cost of the project.

2. Discovery of Lead:
   a. Suspect LCM at all painted surfaces of older campus buildings, brick, and walls and floors in rooms designated (or previously designated) for radiography.
   b. Notify contractors and the University Project Manager via project documents when lead is encountered or thought to be encountered. It is the responsibility of the University Project Manager to consult with EHS to decide what type of action will follow.

3. Lead Renovation:
   a. Perform any renovation of lead containing materials, repair, encapsulation or clean-up in accordance with the above referenced regulatory standards.
   b. Utilize qualified and trained personnel for renovation in accordance with the above referenced regulatory standards.

4. Handling of Lead Waste:
   a. Coordinate with EHS through the University Project Manager.
   b. Include all costs associated with handling of lead waste in the Project Cost.

1.4 SUBMITTALS

A. Abatement Specifications:
   1. Provide a certified asbestos project manager on all asbestos abatement projects in which the amount of friable asbestos material to be abated exceeds 1000 linear feet on pipes or 3000 square feet on other surfaces.
   2. The certified asbestos project manager must prepare and approve written abatement specifications.
   3. Coordinate with the University EHS Department for additional requirements per project.
B. Asbestos Waste Manifests:
   1. Prepare hazardous waste manifests for all asbestos waste shipments associated with University asbestos related projects. Submit copies and originals of these manifests in sequential (numerical) order to the University.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

PART 4 - ILLUSTRATIONS

   1. Coordinate with the University Project Manager for attachments.
ASBESTOS-CONTAMINATED SOIL MANAGEMENT

STANDARD OPERATING PROCEDURE DOCUMENT

UNIVERSITY OF COLORADO DENVER ANSCHUTZ MEDICAL CAMPUS

Prepared for

University of Colorado Denver

February 26, 2010

WALSH

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## Anschutz Medical Campus
### Asbestos-Contaminated Soil Management
#### Standard Operating Procedure Document

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## Attachments

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1 Purpose

This Standard Operating Procedure (SOP) document provides written standard operating procedures that are the minimum requirements for the proper training, handling, packaging, and disposal of asbestos-contaminated soil (ACS) during soil disturbing activities at the Anschutz Medical Campus (AMC) of the University of Colorado Denver (UCD). This SOP document provides specific procedures for the “management” of asbestos contaminated soil to remove only that asbestos contaminated soil, necessary to perform the work. Where “remediation” is intended to remove the full extent and depth of asbestos contaminated soil for a specific area, refer to the attached Soil Sampling and Analysis procedures provided as a supplement to this SOP in Attachment #4 and Remediation procedures provided as a supplement to this SOP in Attachment #5 of this document. The SOP was prepared for CDPHE review and approval to allow AMC to use this SOP for management of the discovered ACS rather than preparing a site specific soil characterization and management plan (SCMP) each time ACS is discovered at ACM. This document is intended for use by those directly involved with soil disturbing activities on the campus, and those who provide management/supervision of these soil disturbing activities.

UCD AMC is part of the University of Colorado and is a 227-acre campus devoted to biomedical education, patient care, and drug development is located in Aurora, Colorado on the site of the former Fitzsimons Army Medical Center. The campus is located on the north side of Colfax Avenue, between Peoria Street and Fitzsimons Parkway.

2 Scope

The procedures provided in this document shall apply to all personnel and all activities involved with the disturbance of soil known to contain asbestos material or soil that may reasonably be considered to contain asbestos material.

3 Primary Contacts, Roles and Responsibilities

<table>
<thead>
<tr>
<th>Organization</th>
<th>Role/Responsibility</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>UCD – Facilities Management</td>
<td>Project Management</td>
<td>Ken Neeper, Manager Infrastructure Development, Phone: 303.724.0249 Email: <a href="mailto:Ken.Neeper@UCDenver.edu">Ken.Neeper@UCDenver.edu</a></td>
</tr>
<tr>
<td>UCD – Environmental Health and Safety Division</td>
<td>Environmental Compliance – Health and Safety</td>
<td>Christina Aguilera Phone: 303.724.0242 Email: <a href="mailto:Christina.Aguilera@ucdenver.edu">Christina.Aguilera@ucdenver.edu</a></td>
</tr>
<tr>
<td>CDPHE HMWMD</td>
<td>Regulatory Agency</td>
<td>Jeff Swanson – Remediation and Restoration Unit – Federal Facilities Program Phone: 303.692.3416 Email: <a href="mailto:jrswanso@cdphe.state.co.us">jrswanso@cdphe.state.co.us</a></td>
</tr>
<tr>
<td>Non-ACS Excavation Contractor</td>
<td>As needed excavation of non-ACS soil in accordance with this plan</td>
<td>To be determined as needed</td>
</tr>
<tr>
<td>ACS Excavation Contractor</td>
<td>As needed removal of ACS in accordance with this SOP</td>
<td>To be determined as needed</td>
</tr>
<tr>
<td>ACS Consultant</td>
<td>As needed ACS Consulting (soil characterization, remediation oversight, soil spotting, air monitoring)</td>
<td>To be determined as needed</td>
</tr>
</tbody>
</table>

4 Definitions and Abbreviations

4.1 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACM</td>
<td>Asbestos-containing materials</td>
</tr>
</tbody>
</table>
4.2 Definitions

"Air Monitoring Specialist" means a person who performs air monitoring referred to in this guidance and who is certified to perform air monitoring in accordance with Air Regulation No. 8, Part B.

Asbestos Soil Inspector means a person certified in accordance with Air Regulation No. 8, Part B, to perform asbestos inspection and sampling, and who has a minimum of six (6) months experience in asbestos-contaminated soil inspections.

"Asbestos Supervisor" means a person who has been certified as an asbestos Supervisor in accordance with Air Regulation No. 8, Part B.

"Asbestos Project Designer" or "Project Designer" means a person who has been certified as an asbestos Project Designer in accordance with Air Regulation No. 8, Part B.

"Adequately wet" means sufficiently mix or penetrate with liquid to completely prevent the release of particulate material and fibers into the ambient air. If visible emissions are observed coming from asbestos-contaminated soil or asbestos-containing material, then the material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being adequately wet. Guidance on determining when a material is adequately wet can be found in EPA’s Asbestos NESHAP Adequately Wet Guidance, EPA 340/1-90-019 (December 1990).

"Asbestos" means the asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), amosite (cummingtonite-grunerite), anthophyllite, and actinolite-tremolite.

"Asbestos-contaminated soil" means soil containing any amount of asbestos.

"Asbestos waste" means any asbestos-containing material whether it contains friable or nonfriable asbestos, that is not intended for further use. This term includes but is not limited to asbestos mill tailings, asbestos from pollution control devices, and containers that contain asbestos.

"Asbestos-containing material" means any material that contains more than one percent (1%) asbestos by weight, area or volume.

"Consultant" refers to entity contracted to perform training, inspections, and air monitoring related to soil disturbing activities in accordance with the SOP.

"Contractor" refers to entity contracted to perform soil disturbing activities in accordance with the SOP.

"Facility Component" means any component associated with a structure, installation, or building and includes buried utilities, tanks, structures or other installations.

"Friable" means that the material, when dry, may be crumbled, pulverized, or reduced to powder by hand pressure, and includes previously nonfriable material after such previously nonfriable material becomes damaged to the extent that when dry it may be crumbled, pulverized, or reduced to powder by hand pressure.

"Leak tight" means that solids, liquids, or gases cannot escape or spill out. It also means dust tight.

"Mechanical" means operated or produced by mechanism or machine. This may include, but shall not be limited to, an excavator, backhoe, grader, tiller, auger, or hand shovel.

"Nonfriable" means material which, when dry, may not be crumbled, pulverized, or reduced to powder by hand pressure.
“Remediation” or “Remediate” means a cleanup or removal to prevent or minimize the possible current or future release of hazardous substances to prevent an unacceptable threat to present or future public health, welfare or the environment.

“Site” or “solid waste disposal site” means the location for a facility chosen based upon geologic, hydrogeologic and operational considerations. For the purpose of Section 5.5 of the Solid Waste Regulations “site” means the area or areas where soil-disturbing activities are occurring or will occur.

“Soil-disturbing activities” means excavation, grading, tilling, or any other mechanical activity used to disturb the soil.

“Visible emissions” means any emissions which are visually detectable without the aid of instruments, coming from material containing asbestos, asbestos waste, asbestos-contaminated soil, or from handling and disposal of asbestos waste, material containing asbestos or asbestos-contaminated soil.

"Work Area" means the area where soil disturbing activities are occurring. For asbestos contaminated soil disturbance, Work Area also means the regulated/controlled area boundary.

5 Disclosure due to Potential to Encounter ACS

The Anschutz Medical Campus (AMC) formerly the Fitzsimons Army Medical Center contained numerous buildings, some of which had been demolished and buried by the Army prior to property transfer to UCD. During development of the site by UCD, buried asbestos-containing materials located on building components (primarily direct buried steam lines, etc) and areas of asbestos-contaminated soil (asbestos debris in soil from prior building demolition, etc) have been discovered on the site. Based on excavation activities to date, these occurrences can be characterized as localized. Based on historical findings, the potential to encounter ACS on the AMC campus fall into one of the three following categories:

1. **Known ACS Area** - An area that is classified as having known ACS is one that has confirmed asbestos-containing material in the soil identified either from subsurface intrusive investigation, or from visual observation on the surface, in sidewalls, embankments, etc. This excavation is conducted by properly trained personnel in accordance with the provisions of this SOP.

2. **Moderate to High Potential ACS Area** – An area that is classified as having a moderate potential for encountering ACS is one based on historical review that asbestos material may be encountered in the soil where non-suspect construction debris has been observed historically, including wood, concrete, brick and metal components. An area that is classified as having a high potential for encountering ACS is one based on historical review that suspect asbestos material is likely to be encountered in the soil where suspect asbestos construction debris has been observed historically. Areas of Moderate to High Potential for encountering ACS may necessitate additional characterization using surface and subsurface visual inspection methods. For areas of Moderate to High Potential ACS, soil excavation activities shall be observed by an asbestos building inspector with 6 months asbestos in soil experience (asbestos soil inspector). For areas of Moderate to High Potential ACS “On-the-job” ACS awareness training shall be provided to workers directly involved with soil-disturbing activities.

3. **Low Potential ACS Area** – An area that is classified as having a low potential for encountering ACS is one in which historical review does not identify buildings or structures that previously existed at the site, utility corridors, other waste materials, or other indications that asbestos may exist on the site. A site classified as having a low potential for encountering ACS would not be a “reason to believe that visible asbestos may be encountered.” Sites with a low potential for encountering ACS would not necessitate additional characterization, spotting, “on-the-job” awareness training, or other special provisions. However, if construction debris or potential ACM is encountered during the course of soil disturbance, then the area would become a moderate to high potential ACS area and will be subject to awareness training, soil spotting and other provisions as described in this SOP.

Asbestos debris in soil at AMC can consist of friable asbestos debris (pipe insulation, etc), nonfriable asbestos debris (floor tile and cement asbestos sheet used on roofs, etc), or a combination of both. Asbestos debris may be limited to a few small pieces that are removed under limited quantity discovery” procedures, or may be in a more extensive “debris field” that will be removed under “significant discovery procedures” as described in Sections 11 and 12 of this SOP.
Upon the discovery of any suspected construction debris material, the contractor shall immediately stop excavation activities in that area, and notify the UCD project manager so the condition can be inspected to determine if asbestos contaminated soil is present. These determinations will be made by an asbestos soil inspector which is an EPA accredited and CDPHE certified asbestos building inspector with 6 months soil inspection experience. Where asbestos contaminated soil is identified, this material shall be removed by a qualified contractor with properly trained personnel, in accordance with applicable regulations and procedures described in this SOP.

6 Regulatory Summary and Regulatory References

6.1 CDPHE Hazardous Materials Waste Management Division (HMWMD) – “Asbestos Contaminated Soils” not associated with the “Built Environment”

To address asbestos in soil, the Colorado Department of Public Health and Environment’s Hazardous Materials and Waste Management Division (HMWMD) has established specific management requirements for asbestos-contaminated soil under Section 5.5 of the Regulations Pertaining to Solid Waste Disposal Sites and Facilities (6 CCR 1007-2). Disposal of ACM, and work done in asbestos-contaminated soil (ACS), must comply with this regulation. The requirements of Section 5.5 of the Solid Waste Regulations apply to the owner or operator of any property with asbestos-contaminated soil at which soil-disturbing activities are occurring or planned for any area containing asbestos-contaminated soil. The requirements of Section 5.5 are triggered when the owner or operator has reason to believe or suspect the presence of asbestos-contaminated soil at a site, (through confirmation by analysis of observed material that is suspected of containing asbestos), or has reason to believe or suspects that visible asbestos will be encountered. An owner or operator that has no reason to know of or suspect asbestos-contaminated soil at a site does not have a duty to sample or otherwise investigate for asbestos-contaminated soil prior to commencing excavation, or other soil disturbing activities, at the site. It is important to understand that there is no language in the Solid Waste Regulations that requires an owner or operator to perform soil-disturbing activities, or to remediate asbestos-contaminated soil. The regulations include specific requirements that apply if asbestos-contaminated soil is disturbed or will be disturbed.

To supplement the regulation, CDPHE developed a guidance document intended to provide direction to contractors, consultants and property owners who are involved in soil disturbing activities in areas with known or suspected asbestos-contaminated soil, or where asbestos-contaminated soil is discovered. The guidance is meant to assist in compliance with the Solid Waste Regulations, and where applicable, Air Quality Control Commission Regulation No. 8, Part B (5 CCR 1001-10, Part B - Asbestos).

CDPHE Solid Waste Regulations identify two methods for addressing ACS, Management and Remediation.

1. **Management** is the removal of only that asbestos-contaminated soil necessary to perform the work, without the intent to remove additional soil outside the scope, even where observed. Management of soil in place is included under this activity. Under management, post removal soil sampling is recommended but not required for soil management actions.

2. **Remediation** is the planned removal of all asbestos-contaminated soil, removing soil beyond a particular scope of work to remove visible and analytical documented presence of asbestos. Under remediation, clearance soil sampling is required.

Both Management and Remediation approaches require CDPHE approval of a site specific soils work plan or a standard operating procedures (SOP) plan.

Remediation would be the appropriate action where a “No Further Action” letter is sought from CDPHE, or where a consent order has been issued by CDPHE, or when “closure” documentation is desired, as Management is the more accepted cost effective option to address soil contamination where this “No Further Action” is not required.
Remediation of asbestos-contaminated soil is not required under the Solid Waste Regulations, but may be conducted in accordance with Section 5.5.5 of the Regulations. It should also be noted that sampling of asbestos-contaminated soil is not required under Section 5.5 of the Solid Waste Regulations; however, the information that can be gained from sampling may be beneficial for many projects. In addition, when conducting remediation required by CDPHE (consent order, etc), sampling may be necessary to demonstrate that cleanup objectives have been met. Remediation will only be conducted at AMC where it is the intent to remediate and/or receive a no further action letter.

In accordance with Section 5.5.2 of the Solid Waste Regulations, the following projects are exempt from the requirements of Section 5.5 of the Solid Waste Regulations, but may be subject to other sections of the Solid Waste Regulations or other regulatory programs:

1. In situations where the soil contains solely nonfriable material containing asbestos, that has not been rendered friable, the nonfriable material can be removed from the soil and properly disposed in accordance with Section 5.2 of the Solid Waste Regulations. The surrounding soil would not be considered to be asbestos-contaminated soil, and therefore would not be subject to the requirements of Section 5.5 of the Solid Waste Regulations. The determination that a material is nonfriable must be made by an asbestos Building Inspector who has been certified in accordance with AQCC Regulation No. 8, Part B, and who has a minimum of six (6) months experience in asbestos-contaminated soil inspections (see Section 8.3 Worker Training).

2. The requirements of Section 5.5 of the Solid Waste Regulations do not apply to asbestos abatement of facility components (including pipes, ducts and boilers) conducted in accordance with AQCC Regulation No. 8, Part B. However, disposal of asbestos must still comply with Sections 5.1 through 5.4 of the Solid Waste Regulations.

3. The requirements of Section 5.5 of the Solid Waste Regulations do not apply to spill response activities that are subject to the requirements of AQCC Regulation No. 8, Part B. As above, disposal of asbestos must still comply with Sections 5.1 through 5.4 of the Solid Waste Regulations.

4. Ambient occurrences of asbestos that are not due to site-specific activities. Ambient occurrences of asbestos may include, but are not limited to, naturally occurring asbestos or the distribution of asbestos from normal wear of automotive products.

5. Projects involving excavations with a total volume of less than 1 cubic yard of soil using low-emission excavation methods such as hand held tools or light equipment.

The exemption for asbestos abatement projects conducted under AQCC Regulation No. 8, Part B, includes asbestos debris that may come into contact with soil during demolition of structures with asbestos-containing materials and materials containing trace amounts of asbestos (including trace soil in crawlspaces, loose fill vermiculite, etc) that can legally remain during demolition and be disposed of as normal demolition debris. Any asbestos debris left behind after the completion of a demolition project and associated site cleanup, would be subject to the requirements of Section 5.5 of the Solid Waste Regulations if disturbed in the future.

6.2 EPA, OSHA DOT and CDPHE Air Pollution Control Division (APCD) “Asbestos/Asbestos Contaminated Soils” associated with the “Built Environment”

The Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA) and the Colorado Department of Public Health and Environment (CDPHE) define asbestos-containing material (ACM) as any material containing greater than 1% asbestos as asbestos-containing material. EPA, OSHA and CDPHE define friable materials as those materials that can be crumbled or reduced to powder by hand pressure, whereas nonfriable materials cannot. Friable materials are more likely to be released into the air, especially during renovation and demolition of the building. Under EPA and CDPHE regulations, certain types of nonfriable materials (such as tar impregnated roofing and vinyl asbestos floor tile) may remain during normal demolition (provided these materials remain nonfriable during the demolition process) and also may be disposed of as normal demolition debris. In addition drywall joint compound that contains greater than 1% asbestos may remain in a building for demolition and disposal as normal demolition debris provided the joint compound was not used as a surfacing material and the composite result of the drywall and joint compound reported less than 1% asbestos. Additionally, materials containing trace to 1% are not subject to EPA and CDPHE regulations and may remain in a building during
demolition and may be disposed of as normal demolition debris. Under these provisions, it is common for asbestos to remain in a building for demolition and for subsequent disposal as normal demolition debris.

ACM is subject to the EPA National Emissions Standards for Hazardous Air Pollutants (NESHAPs) Regulations for Asbestos (40 CFR Part 61) which includes specific provisions for renovation and demolition projects pertaining to the “built” environment, and disposal of asbestos-containing waste material. ACM is subject to the EPA Toxic Substances Control Act (TSCA) which includes provisions for training and certification for asbestos remediation and consulting activities. The CDPHE is presently responsible for administering the EPA NESHAP and TSCA program for Colorado.

ACM is subject to OSHA Construction Industry Standard for Asbestos (29 CFR Parts 1910.1101). Materials containing 1% or less asbestos may be subject to OSHA regulations under certain classes of work activity, or if air concentrations are at or above the personal exposure limit (PEL) of 0.1 f/cc or the excursion limit of 1.0 f/cc. The OSHA asbestos standard includes provision for hazard communication, training, exposure assessment, respiratory protection, engineering controls, medical evaluations, and other provisions.

ACM is subject to Department of Transportation (DOT) regulations for packaging, labeling and transportation of asbestos under 49 CFR Part 173.

ACM is subject to applicable requirements of the CDPHE Air Pollution Control Division’s (APCD) Regulation 8. The term Abatement is defined by the CDPHE under the Air Pollution Control Division Regulation 8, and includes the removal of asbestos-containing materials covering facility components, which includes discovery wrapped steam line found below grade, transite© water pipe, or an abandoned buried boiler covered with asbestos. Removal of asbestos in soil associated with facility components would be subject to the requirements under CDPHE Air Pollution Regulation 8, including contractor licensing, worker certifications, permitting, etc.

1. Removal of asbestos-containing material on a facility component, that is located on or in soil that will be disturbed, shall be conducted (as stipulated under Section 5.5 of the Solid Waste Regulations), in accordance with work practices in AQCC Regulation No. 8, Part B, Section III.O, but is not subject to the permit requirements of AQCC Regulation No. 8, Part B, as long as the total quantity of asbestos-containing material is below the following trigger levels:
   a) 260 linear feet on pipes,
   b) 160 square feet on other surfaces, or
   c) The volume equivalent of a 55-gallon drum.

2. Removal of asbestos-containing material on a facility component with asbestos quantities above the trigger levels is subject to the notification, permit, and abatement requirements of AQCC Regulation No. 8, Part B, and is therefore outside the scope of Section 5.5 of the Solid Waste Regulations, as provided in Section 5.5.2(B) of the regulations.

3. Removal of pieces of asbestos-containing material, that are not on a facility component, and are located on or in soil that will be disturbed, shall be conducted under Section 5.5 of the Solid Waste Regulations, in accordance with work practices in AQCC Regulation No. 8 - Part B, Section III.O. The removal activities would not be subject to the permit requirements of AQCC Regulation No. 8, Part B.

Under EPA NESHAPs/CDPHE APCD regulations, the primary consideration under this SOP is adherence to CDPHE APCD Regulation 8 requirements for the discovery of asbestos-containing materials on buried facility components such as piping, boilers, etc and the proper removal in accordance with the EPA NESHAPs and CDPHE APCD regulations. Under CDPHE APCD regulations, secondary consideration under this SOP is the proper removal of all construction debris including nonfriable materials allowed to remain during demolition, asbestos-containing joint compound (where composite result reported less than 1%) and trace-1% asbestos materials. Where demolition debris is allowed to remain after demolition activities have been completed, any presence of asbestos in the soil would then be subject to the CDPHE HMWD ACS regulations. This issue is addressed in more detail in Section 13 (Special Considerations) of this SOP.

All work on asbestos-containing materials (ACM) must comply with the applicable requirements of EPA, OSHA, DOT and CDPHE APCD asbestos regulations.
6.3 References


CDPHE. 2006. *Asbestos-Contaminated Soil Regulations*. Section 5.5 of the Hazardous Materials and Waste Management Division’s Regulations Pertaining to Solid Waste Disposal Sites and Facilities


OSHA. *Construction Industry Standards for Asbestos*. 29 CFR 1926.1101

7 Classification of Types of Soil Disturbing Activities

The following are the classifications of soil disturbing activities under this SOP.

1. **“Localized Limited Quantity Shallow Hand Digging”** - This covers localized limited quantity (less than 1 cubic yard of soil) shallow hand digging from surface to 24 inches in depth, that is typical in the normal day-to-day operations of the campus, including sprinkler repair, planting shrubs and small potted plants, and installing fence posts/signs, etc.

2. **“Small Scale” Localized Hand/Equipment Excavation** - This covers deeper (greater than 24 inches) localized excavation generating greater than 1 cubic yard of soil, and includes hand digging or small/light equipment (backhoe, mini excavator, tree planters, min-excavators, and hole drilling augers, etc) for minor utility repair, tree planning, etc. With these types of excavations, the work is a very short (day duration), and the soil is typically deposited in the same location from which it is removed, and is not typically subject to relocation.

3. **“Moderate Scale” Localized Equipment Excavation** – This covers larger scale “localized” excavations that involve trenching or pothole excavation typically to install or repair buried utilities. With these types of excavations, the work is a is short to moderate duration (days to weeks), is conducted with a moderate sized “back-hoe” or excavator” and the soil is typically deposited in the same location from which it is removed, and is not typically subject to relocation. An example of this would be utility corridor trenching.

4. **“Large Scale” Equipment Excavation** – This covers largest scale excavations that involve mass excavation of a site, usually for building construction or other site development purposes. With these types of excavations, the work is a moderate to long duration (weeks to months), is conducted with large excavators, scrapers, front end loaders, etc, and the soil is typically subject to relocation on and off-site, with potential for additional soil import, depending on final grade requirements. An example of this would be “mass excavation” performed for construction of a new building.
8 Excavation Notifications

The following table summarized the types of **notifications required prior to conducting soil disturbing activities**.

<table>
<thead>
<tr>
<th>Low Potential ACS condition</th>
<th>Moderate to High Potential ACS condition</th>
<th>Known ACS condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Localized Limited Quantity (less than 3 cubic yards) Shallow Hand Digging (less than 24 inches in depth for sprinkler repair, shrub/planting small potted plants, installing fence posts/signs etc)</td>
<td>No notification required</td>
<td>No notification required</td>
</tr>
<tr>
<td>Localized Small Scale Hand/Equipment Excavation more than 3 cubic yards and greater than 24 inches in depth (minor utility repair, tree planning, etc)</td>
<td>No notification required</td>
<td>Notification to UCD prior to start</td>
</tr>
<tr>
<td>Moderate Scale Localized Equipment Excavation (utility trenching)</td>
<td>Notification to UCD prior to start</td>
<td>Notification to UCD prior to start</td>
</tr>
<tr>
<td>Large Scale Equipment Excavation (mass excavation)</td>
<td>Notification to UCD prior to start</td>
<td>Notification to UCD and CDPHE prior to start</td>
</tr>
</tbody>
</table>

CDPHE will be notified within 24 hours of an unexpected ACS and/or ACM discovery. CDPHE will be notified at least 10-days prior to any planned soil-disturbing activity in areas of known ACS and/or ACM. The HMWMD can be notified by using the Notification Form attached to this plan, and emailed to CDPHE contact identified in Section 3 of this SOP. If ACS is encountered and an area reclassified as “known ACS condition” that CDPHE will be notified prior to start or re-start of work.

Additional notification shall be provided to UCD if construction debris is encountered in areas determined to be low potential ACS condition. **Notification to UCD includes notification to UCD Facilities Planning Department contact and UCD Environmental Health and Safety Division contacts as provided in Section 3 of this SOP.** The Contractor shall notify and receive approval from the UCD project manager prior to any soil being exported or imported to the project. Contractor shall coordinate any inspections, spotting, or testing requested by the UCD project manager for any exported or imported soils to the project. For emergency repair projects to utilities, etc, notification will be provided to CDPHE by the next business day.
9 Excavation Planning

Prior to performing any soil disturbance activities, those persons performing the soil disturbing activity shall check the AMC ACS Asbestos Contaminated Soils Classification Site Drawing (Attachment #1) to determine the classified ACS condition for the area where soil disturbing activities will occur. Comply with notification, training and work procedures provisions of this document based on the classified condition for the area where excavation will occur which will be classified into one of the following three categories:

- Low Potential ACS Condition (areas shaded green)
- Moderate to High Potential ACS Condition (areas shaded yellow)
- Known ACS Condition (shaded coded red)

The following soil spotting activities will be utilized during all excavation activities for moderate to large scale excavation activities when moderate to high potential ACS conditions exist:

1. All surface work areas will be pre-inspected by the asbestos soil inspector prior to commencement of soil disturbance activities.
2. Excavation Area: conduct a subsurface visual inspection for asbestos material during excavation. The asbestos soil inspector will inspect all areas of the excavation as removal of soil proceeds, and will inspect the bottom of the excavation for visible ACM.
3. Stockpile and Backfill Areas: closely inspect stockpiled area as soil is dumped/piled.

Where ACS is identified and impacted by planned excavation, the characterization, removal and disposal of contaminated soil shall be conducted in accordance with the provisions of this SOP. Once the asbestos soil inspector has delineated the ACS boundaries (depth and extent through visual inspection characterization protocols as provided in Section 11 of this SOP), the Contractor may continue excavation in other non-ACS areas with continued spotting by an asbestos soil inspector.

For localized limited quantity (less than 1 cubic yard) shallow (less than 24 inches) hand digging for normal day-to-day operations, including sprinkler maintenance, installation of signs/posts, planting of small plants and shrubs, etc, these activities are exempt from this SOP since these activities typically occur in newly constructed areas with shallow digging occurring in the top fill layer placed during new construction, which has a low potential to contain asbestos debris, and less than 1 cubic yard by hand-digging is exempted under CDPHE HMWMD regulations. Notification shall be provided to UCD if construction debris is encountered under these exempted activities.

For additional planning purposes and as a reference, an historical site map is provided in Attachment #2 that shows the building and steam tunnel locations for the former Fitzsimons Army Medical Center. Attachment #3 contains a flow chart that summarizes the key components of this SOP document.

10 Training Requirements

10.1 SOP circulation

The following entities/persons involved with soil disturbing activities shall be provided a copy of this SOP prior to performing work:

1. Those performing soil disturbing activities in areas with moderate to high potential to encounter ACS
2. Those providing awareness soil training
3. Those providing soil inspection or soil spotting activities during normal excavation activities.
4. Those performing soil disturbing activities in a known ACS condition area
5. Those providing air monitoring and inspection associated with soil disturbing activities in a known ACS condition area.

10.2 Awareness Training

For areas with moderate to high potential to encounter ACS, all those persons involved with the excavation regardless of size shall be provided on the job hazard communication awareness (awareness) training for those individuals associated with the soil disturbing activities as follows:

“On-the-job” asbestos soils awareness training as defined in Section 5.5.6 of the Solid Waste Regulations will be provided to workers directly involved in soil-disturbing activities on sites where there is known ACS or a “reason to believe” ACS may be encountered. The training will address such topics as history and background of asbestos, identifying types of asbestos, health effects, engineering controls, and actions to take when suspect asbestos materials are encountered. The training will be conducted with oversight and curriculum development by an asbestos building inspector, asbestos supervisor or project designer.

The awareness training must provide information necessary for the individuals to perform their duties in a way that ensures compliance with the requirements of Section 5.5 of the Solid Waste Regulations. The training must be conducted by an Asbestos Supervisor, Building Inspector or Project Designer, certified in accordance with AQCC Regulation No. 8, Part B, and who has a minimum of six (6) months experience in asbestos-contaminated soil management.

10.3 ACS Soil Disturbance Training

For moderate to large scale excavation activities in areas with known ACS, provide on the job hazard communication awareness training for those individuals associated with the soil disturbing activities. In addition personnel overseeing, directing, inspecting and/or handling asbestos or asbestos-contaminated soil during soil excavation activities shall have the following minimum training and certifications:

1. At least one (1) trained supervisor (competent person) shall be on site during excavation activities (current EPA Asbestos Supervisor Certification)
2. CDPHE HMWMD training required for persons performing asbestos-contaminated soil disturbing activities including on the job asbestos contaminated soil awareness training and training in accordance with OSHA standard 1926.1101 (k) (9) (vii) for those performing soil disturbing activities in an area with asbestos waste or asbestos contaminated soil (EPA Asbestos Supervisor/Worker training is recommended).
3. A current annual physical with medical release / respirator usage form and respirator fit test.

This training requirement applies to equipment operators but is not required for drivers of trucks carrying contaminated material for disposal to approved landfills. Drivers are only required to complete the awareness training.

For small scale excavation activities with known ACS, provide awareness training for those individuals associated with the soil disturbing activities. In addition personnel overseeing, directing, inspecting and/or handling asbestos or asbestos-contaminated soil during small scale soil excavation activities shall have the following minimum training and certifications:

1. At least one (1) trained supervisor (competent person) shall be on site during excavation activities.
2. CDPHE HMWMD training required for persons performing asbestos-contaminated soil disturbing activities including on the job asbestos contaminated soil awareness training and training in accordance with OSHA standard 1926.1101 (k) (9) (vii) for those performing soil disturbing activities in an area with asbestos waste or asbestos contaminated soil (Training Equivalent with OSHA Class III training for “small scale short duration” activities that will disturb asbestos recommended).
3. A current annual physical with medical release / respirator usage form and respirator fit test.

10.4 ACS Inspection and Air Monitoring Training

Individuals performing soil inspection and identification of asbestos in soil must have a current asbestos Building Inspector certification in accordance with AQCC Regulation No. 8, Part B, and must have a minimum of six (6) months experience conducting asbestos-contaminated soil inspections. Individuals with this level of training and experience are referred to in this SOP as “asbestos soil inspectors”.

Individuals preparing and signing Soil Characterization and Management Plans must have a current Asbestos Project Designer certification in accordance with AQCC Regulation No. 8, Part B.

Individuals performing asbestos air monitoring associated with asbestos-contaminated soil disturbing activities must have a current Air Monitoring Specialist certification in accordance with AQCC Regulation No. 8, Part B.

10.5 Additional Considerations

In addition, individuals with the potential for exposure to asbestos fibers should be trained in the proper usage of personal protective equipment and have a current annual physical with a medical release/respirator usage form in accordance with the employer’s medical surveillance program. Personal exposure air monitoring should be conducted in accordance with the employer’s exposure assessment program.
11 ACS Characterization Protocols and Trigger Levels

The following summarizes the potential conditions that may be encountered during soil disturbing activities at the AMC:

1. Localized areas of friable and/or nonfriable asbestos debris in soil that constitute “significant quantity” as provided under the “trigger level” of this plan. Triggering “major” response procedures as provided in this plan.
2. Localized areas of friable and/or nonfriable debris in soil that constitute “limited quantity” as provided under the “trigger level” portion of this plan, triggering “minor” spill response during planned excavation spotting activities.
3. Localized areas with construction debris with no asbestos debris, such as brick, metal, and PVC pipe, and non-asbestos suspect debris (confirmed by bulk sampling).
4. Localized areas where no visible construction debris, or visible suspect asbestos containing materials are present.

To provide a basis for appropriate level of assessment (limited vs. significant) and management for discovered asbestos debris, the following summarizes specific trigger levels to be used under this SOP. These trigger levels are “limited quantity discovery” and “significant quantity discovery” of visible friable and/or nonfriable asbestos debris and have corresponding assessment and response actions based on the limited or significant finding:

11.1 Limited Quantity Material Discovery Assessment and Management Protocol

Entry into Limited Quantity Assessment and Management Protocols: Where up to 3 pieces (with multiple pieces of asbestos within a few inches of each other to be treated as one piece of asbestos) of friable and/or nonfriable asbestos debris are identified within a 10-foot radius, record the locations with a GPS unit, photograph and log pertinent information such as location, description of material, type of debris, etc.

Exit from Limited Quantity Assessment and Management Protocols: Carefully wet and remove the visible debris and 3 cubic feet of soils surrounding each debris piece. All debris will be adequately wetted, and removed by appropriately trained and protected personnel. All debris and associated soil will be placed into appropriately labeled disposal bags, for proper disposal based on the material friability.

11.2 Significant Quantity Material Discovery Assessment and Management Protocol

Entry into Significant Quantity Assessment and Management Protocols: Where greater than 3 pieces (with multiple pieces of asbestos within a few inches of each other to be treated as one piece of asbestos) of friable and/or nonfriable asbestos debris are identified within a 10-foot radius, this will constitute a debris field. The asbestos soil inspector will conduct surface and subsurface visual assessment with the assistance of excavation equipment to determine the extent and depth of the asbestos debris field. All
asbestos debris field corner points will be documented with a GPS unit, on a drawing and by photograph. Photograph and log pertinent information such as type of debris, quantity, etc.

**Exit from Significant Quantity Assessment and Management Protocols:** Removal of debris field based on a visual determination to the extent of excavation, or removal of extent of find (EOF) plus 1 foot of soil, and removal of depth of find (DOF) plus 1 foot of soil for subsurface contamination, and removal of extent of find (EOF) plus 1 foot of soil where only surface contamination is identified. Where visible friable and/or nonfriable asbestos debris is still observed at the extent of planned excavation, the area will be over excavated by 1 foot, and then covered with a geotechnical membrane and labeled/demarcated as asbestos-contaminated soil, and covered with 1 foot of clean fill. The boundary will be recorded with a GPS unit, on a drawing, and by photograph.

**11.3 Visual Characterization for Significant Discovery**

Site characterization (surface and subsurface visual assessment) will be conducted by using visual inspection to identify depth and extent of visible significant debris using potholing and trenching techniques for asbestos debris. Soil sampling and analysis is not part of the characterization process under this SOP, and any collection and analysis of soil samples for asbestos content requires written authorization from UCD.

**11.4 Surface Investigation**

Surface investigation for areas identified as having potential asbestos-containing debris will be conducted for suspect asbestos debris. Surface investigation will include sampling suspect asbestos-containing material, or will assume material is asbestos-containing. Marker paint and flags will be used to demarcate locations of any suspect debris. Locations will be identified with a GPS device. The surface investigation will include photographing and logging pertinent information such as location, type of debris, quantity, etc.

**11.5 Investigation Personal Protective Equipment**

At a minimum, appropriate PPE must be worn when doing asbestos inspections or otherwise accessing an area suspected or known to contain asbestos. At a minimum, asbestos soil inspectors performing the inspection and/or personnel performing the pickup of non-friable asbestos must wear disposable booties and disposable rubber gloves, which should then be discarded as asbestos waste prior to exiting the site. At a minimum, asbestos soil inspectors performing the inspection and/or personnel performing the pickup of friable asbestos must wear a half-face air-purifying respirator with HEPA cartridge filtration, disposable protective suit, disposable booties and disposable rubber gloves. Disposable protective equipment should then be discarded as asbestos waste prior to exiting the site. Additional protective equipment shall be used as appropriate.

**11.6 Demarcation of Discovery Locations and ACS Boundaries**

Locating debris and other site conditions by GPS where specified in this SOP is considered the primary method for documenting these locations, but distance measurement (XYZ coordinate) descriptions may be used where a site grid is utilized or where locations are adjacent to structures or features. Grid/Structure reference points shall be documented with GPS in the event grid markers or structures are removed.
12 Limited Quantity ACS Management Procedures

Where the asbestos soil inspector visually observes up to three pieces of friable and/or nonfriable asbestos debris within a ten (10) foot radius, follow the procedures listed below.

For nonfriable asbestos material, adequately wet, using hand-removal methods only, gather and place the material and approximately 12 inches of surrounding soil in 6-mil poly bags. For friable asbestos material, adequately wet, using hand-removal methods only, gather and place material and 3 cubic feet of surrounding soil in 6-mil poly bags (double bags). Continue work with extra attention to possible additional asbestos in that vicinity. Stage waste bags in a lined drum or roll-off container. Dispose of waste as asbestos contaminated waste in accordance with CDPHE regulations and this SCMP.

All personnel involved in the removal of Limited Quantity asbestos debris will wear at a minimum a half-face air purifying respirator with HEPA filtration, and disposable protective suit, disposable overbooties and disposable gloves. Decontamination of all tools and equipment involved in the removal of asbestos debris is required prior to leaving the work area. Disposable suits, overbooties and gloves shall be disposed of as asbestos waste.

13 Significant Quantity ACS Management Procedures where only Nonfriable Asbestos Material is Present

Where the asbestos soil inspector visually observes more than three pieces nonfriable asbestos debris within a ten (10) foot radius, follow the procedures listed below.

13.1 Soil Wetting and Stabilization

The Work Area will be adequately wetted to prevent any fugitive dust emissions that may be generated during initial setup and mobilization into the area. The Contractor shall use water hoses from a tank truck or directly from a fire hydrant or other water source. Water will be applied at low pressure so as to not generate dust or splattering. During all soil disturbing activities, wetting of soil will be sufficient to ensure soils are adequately wet (no visibly dry soil and no visible emissions) throughout the soil disturbing activities.

13.2 Dust and Emissions Control

General dust control will be achieved by use of water trucks that will regularly spread water on all access roads throughout the project site to ensure no visible dust generation by vehicle traffic during soil disturbance activities. Whenever contaminated soil and debris are being impacted, the Contractor will ensure that no emissions are generated. UCD’s representative will be on site to monitor the moisture of the soil being skimmed during removal and will ensure that it is adequately wet (and to observe for any visible emissions). An asbestos soil inspector will conduct these visual inspections.

If emissions are observed during the removal process, activities will immediately cease and work practices will be reviewed and modified by the Contractor. The Consultant will log all instances where visible dust emissions occurred and immediately notify UCD and CDPHE by phone and in writing, of all occurrences, and will obtain any direction from UCD and CDPHE.

13.3 PPE

During the actual soil disturbance activity, all persons within the designated work area shall utilize appropriate personal protective equipment, including appropriate respiratory protection with a minimum half face respirator with HEPA filtration required anytime active soil disturbance is occurring, protective full body tyvek® suit with attached
hood and booties, gloves, rubber boots, and other protective wear as appropriate based on conditions (cold stress, heat stress, insects, etc)

13.4 Removal/Excavation

The Contractor will remove adequately wet soil in lifts with the lift thickness is determined by the depth of the adequately wet soil. The application of amended water to work area will be completed in accordance with all applicable regulations, variances, the work plan, and the on-site observations by the Consultant. Polyethylene sheeting will be placed over uncontaminated soils in the swing radius of the excavator or along the transport route of loading equipment to prevent cross-contamination. Care will be taken to avoid contamination of the excavating equipment. This will be accomplished by driving and keeping excavating equipment on non-contaminated soil.

Equipment that comes in contact with contaminated soil, or that was within the designated work area will be decontaminated. Conduct work with appropriate phasing/sequencing that will minimize cross-contamination potential.

13.5 Wind and Work Stoppage Conditions

Soil disturbance operations will not be conducted if winds produce visible emissions of dust or create dust when moving equipment or soil.

13.6 Environmental Monitoring

During the execution of the soil removal, the AMS will collect air samples to assist in determining the adequacy of the engineering and environmental controls employed at the site. Air monitoring will be conducted during ACS significant discovery soil removal activities where only nonfriable material is visible. All air samples will be collected by a CDPHE certified Air Monitoring Specialist (AMS).
The air monitoring is described below.

1. **Sampling Media:** Air samples will be collected by drawing air through a 25-millimeter mixed cellulose ester filter, 0.8-micron pore size, with an open-faced, long cowl using low-flow personal sampling pumps at approximately 2 liters per minute (or flow rate to provide a sufficient LOQ/LOD). Each low-volume pump will be fitted with a computer microchip, which electronically regulates airflow and allows a fixed flow rate of air to pass over the face of the filter. The flow rate and the volume of air passed through the filter will be determined based on the National Institute for Occupational Safety and Health (NIOSH) 7400 analytical method. Each pump will be calibrated before and after the collection of each sample using a primary standard.

2. **Sample Analysis:** Sample analyses will be performed by a microscopist using a phase contrast microscope (PCM) according to the NIOSH 7400 Method. The microscopist will be a CDPHE certified Air Monitoring Specialist (AMS) and a participant in the NIOSH Proficiency Analytical Testing Program and have been deemed proficient. Analyses of transmission electron microscopy (TEM) air samples will be submitted to a National Institute for Standards and Technology National Voluntary Laboratory Accreditation Program accredited laboratory using TEM according to Asbestos Hazard Emergency Response Act protocol.

3. **The daily air monitoring sampling scheme will be as follows:**
   a. Air samples will be strategically placed as close to work area without impeding equipment and worker activity, and will be collected continuously during excavation and loading operations and submitted the same day for PCM analysis. **A total of 5 samples will be collected per shift per work area.**
   b. Of the 5 samples collected, three (3) perimeter samples will be placed to triangulate the work area, moving as necessary to follow the active “area-of-disturbance”, but **remaining fixed in relation to each other.** One (1) additional perimeter “floating sample” will be placed downwind from work activities, where potential fiber emissions are most likely to be detected. All perimeter samples shall be collected as close to the “point of disturbance” as possible, without subjecting the air monitoring equipment to damage from the operations. One (1) additional sample, to be considered the potential worst-case scenario “area equivalent” sample, will be collected on personnel closest to disturbance operations, such as the person operating the water hose.
   c. The results from these samples for comparison to 0.01 f/cc (and presence of asbestos for when analyzed by TEM) and should not be construed as “OSHA exposure assessment air samples”.
   d. **Performance Based Air Sampling:** Five (5) samples, including personnel and perimeter samples, will be submitted for PCM analysis. If analysis yields results with detectable fiber levels (based on fiber count) then TEM analysis will be conducted on the two (2) highest PCM samples for the first 3 days of each nonfriable excavation event. If no asbestos fibers are detected after the first 3 days of each event, then TEM analysis of the two (2) highest PCM samples will be reduced, to be conducted randomly twice per week. The AMS will determine on which two days **TEM analysis** will be conducted. TEM analysis will continue to be performed on any sample with PCM results exceeding 0.01 fibers/cc. .

4. PCM verbal results will be made available by the start of the next business day or as soon as practical after the start of the next business day. TEM verbal results will be made available within 24-hours of receipt of samples by the laboratory, and written results will be made available within 24 hours from the time the verbal result is received. UCD and CDPHE will be immediately notified if any sample results show any concentration of airborne fibers. If any asbestos fibers are detected by TEM, all investigative activities will be stopped and engineering controls will be evaluated by Contractor and Consultant, and will be discussed with UCD and CDPHE to determine if changes in engineering controls or additional PPE are required.

5. **As an alternative to Environmental Air Monitoring for significant quantity nonfriable excavation, where soil sampling is performed in areas containing only visible nonfriable asbestos debris (per a soil sampling plan as agreed upon by UCD and CDPHE), and where soil sampling data demonstrates that no asbestos is present in the soil, and excavation work practices will not render the nonfriable material friable, environmental air monitoring may be reduced to PCM on workers only with the written approval of UCD and CDPHE.**

13.7 **Personal Air Monitoring**

Air sampling of personnel is an employer based responsibility, and as such shall be the responsibility of each employer associated with soil disturbing activities. The “area equivalent” samples collected on personnel are
interpreted as “worst case area” samples and are not intended to provide OSHA exposure information, but can be used by employers for general informational purposes.

### 13.8 Truck/Container Staging/Lining and Waste Loading

All truck drivers will be instructed to close all windows and shut-off air delivery systems (fans on air-conditioning and heating systems) when entering the loading area. All travel and positioning of waste transport Truck/Trailers on the site should be visually verified clean soil to minimize the need for decontamination procedures. At the loading location, install a ten-mil polyethylene sheeting or thicker “lay-down pad” that will be placed on the ground under dumpsters/trucks to catch any spilled material. Spilled material will be cleaned up immediately and not allowed to dry out or accumulate. Additional poly shall be draped over trailer tires/fenders to minimize the need for decontamination after loading. After the load has been secured, and the load cover tarp is installed, the poly sheeting lay down loading pad will be properly decontaminated using wet wipe and or HEPA vacuuming methods. The loaded transportation truck may then proceed down the designated exit route.

### 13.9 Waste Transportation and Disposal

Containers of nonfriable asbestos waste, asbestos-contaminated soil with visible nonfriable asbestos, or ACS with no visible asbestos will be labeled, in accordance with the requirements of Section 5.2 of the Solid Waste Regulations. In accordance with the disposal requirements for nonfriable asbestos waste at least one 6-mil polyethylene liner/sheeting will be in trucks used for transport of soil that contains visible nonfriable asbestos. Polyethylene liners/sheeting should be designed and sized for the container to be used and should be folded over sides of trailers or containers to protect against contamination during loading and to facilitate decontamination. After loading, the liners/sheeting will be sealed and mechanically fastened in a manner that ensures that it remains intact and leak-tight during transportation and disposal operations. Containers of nonfriable asbestos waste, asbestos-contaminated soil with visible nonfriable asbestos, and asbestos-contaminated soil with no visible asbestos, shall be labeled noting “asbestos, danger” and the generator, and placed on top of sealed liner.

In addition, Department of Transportation (DOT) asbestos placards shall be placed on all four vertical sides of the container or vehicle being used for transport of ACS. The Contractor should direct the schedule of transportation of asbestos-contaminated soil. When loaded, each truck should be assigned a manifest to serve as the shipping document for that particular load.

Asbestos-contaminated soil shall be transported and disposed in a leak tight container in accordance with the CDPHE disposal requirements. Documentation stating that the soil originating from the site will not be used as daily cover or sold as clean fill shall accompany each load of asbestos-contaminated soil removed from the site.

Disposal of asbestos-contaminated soil will be conducted in accordance with the following requirements, in accordance with Section 5.5.7 of the Solid Waste Regulations:

1. Asbestos-contaminated soil containing only visible nonfriable asbestos, that has not been rendered friable, will be disposed of as nonfriable asbestos in accordance with Section 5.2 of the Solid Waste Regulations.
2. Asbestos-contaminated soils containing no visible asbestos will be disposed in a manner similar to nonfriable asbestos waste, as described in Section 5.2 of the Solid Waste Regulations.

### 13.10 Personnel Decontamination

A fully functioning 3-chamber decontamination trailer (or equivalent) will be placed outside the work zone to function as a remote shower location, with a clean room and an equipment room. All workers involved in removal/packaging ACS will be double suited while in the work area and will shed one suit prior to leaving the work area and immediately proceed to the decontamination facility. All workers will decontaminate per OSHA regulations and CDPHE Regulation No. 8. Decontamination water will be filtered using a 5 micron filter, or in accordance with local requirements if more stringent, prior to disposal to the sanitary sewer.
13.11 Equipment Decontamination

All equipment and tools that come into contact with, or are used for removal of ACS will be decontaminated (free of all visible dust and debris) using wet cleaning (fire hose for trackhoe equipment, wet rags for hand tools, etc) and HEPA vacuuming methods (interior of equipment cab, etc), prior to leaving the work zone. Equipment decontamination will be conducted within a decontamination station constructed adjacent to the work zone. The decontamination station will be constructed of 10-mil polyethylene sheeting (and other materials as necessary, such as EPDM rubber roofing, etc) in such a way as to capture all contaminated material and wastewater from the decontamination process. All waste water from the decontamination station will be filtered to a minimum of 5-microns (or in accordance with local requirements if more stringent, prior to discharge to a sanitary sewer), or may be used for wetting ACS.

13.12 Final Inspection Procedures

As the project progresses, visual inspection will be performed to ensure that all observable asbestos-containing materials have been removed from the soil surface. During removal of soil, the soil will be removed in a manner that will provide a flat, even surface (with no spoil piles) for visual inspection. The inspections will be performed for the surface area removed that day, as a preliminary inspection. Due to the wet nature of the removal and the soil, adequate drying time is required before a final visual inspection can be conducted.

The removal of soil in the debris field area will be considered complete when the visible asbestos-containing material has been removed and an asbestos soil inspector makes a final decision that all contaminated soil in the debris field has been removed to depth and extent of excavation (where remaining visible material will be covered with a membrane and labeled), or depth of find plus 1 foot of soil (DOF+1) and extent of find plus 1 foot of soil (EOF+1).

13.13 Managing ACS left in place

Where visible asbestos containing material is observed at the depth and extent of excavation, 1 additional foot of soil shall be removed, the area shall be covered with a geotech membrane, labeled as asbestos contaminated soil, and then the membrane shall be covered with 1 foot of clean fill to bring back to desired grade/level. Prior to covering with clean fill, photographs will be collected from each compass point of the boundary, and the corner points of the boundary shall be obtained using measurements for a control point or with a GPS device.

14 Significant Quantity ACS Management Procedures whereFriable Asbestos Material is Present

Where the asbestos soil inspector visually observes more than three pieces friable asbestos debris within a ten (10) foot radius, follow the procedures listed below.

14.1 Site Control, Demarcation, Fencing and Wind Screening

The Work Area will be demarcated on all four sides using a movable/portable wind barrier to prevent wind dispersal of soil during excavation activities. Moveable/portable wind barriers will be placed on all four sides and immediately adjacent to the point of excavation, and will be of adequate height and configuration (size) to minimize wind soil dispersal at the point of excavation. For smaller areas or highly mobile removal activities, moveable “directional” mobile wind fencing may be used, but must be positioned upwind and adjacent to soil removal activities at all times. Where only directional wind fencing is used, asbestos barrier tape shall be installed to identify the remaining boundary of the Work Area (where wind fence is not positioned).
14.2 Protection of Adjacent Structures
When the abatement area is close to occupied structures, external critical barriers may need to be constructed. All openings in the structure, including windows, doorways, vents or other openings will be sealed with 6-mil poly.

14.3 Soil Wetting and Stabilization
The Work Area will be adequately wetted to prevent any fugitive dust emissions that may be generated during initial setup and mobilization into the area. The Contractor shall use water hoses from a tank truck or directly from a fire hydrant or other water source. Water will be applied at low pressure so as to not generate dust or splattering. During all soil disturbing activities, wetting of soil will be sufficient to ensure soils are adequately wet (no visibly dry soil and no visible emissions) throughout the soil disturbing activities.

14.4 Dust and Emissions Control
General dust control will be achieved by use of water trucks that will regularly spread water on all access roads throughout the project site to ensure no visible dust generation by vehicle traffic during soil disturbance activities.

Amended water and or stabilization agents will be applied for dust control within all disturbed ACS areas. The Contractor will maintain the dust control process throughout the course of the project during soil disturbing activities. Removal of soils and debris will be done with heavy equipment which has been adapted to have a water misting system installed on the equipment to minimize dust emissions at the point of removal. Water will be applied in a manner that does not cause run-off or splattering. In addition, a water misting system will be constructed to wet the material at the point of loading into the dumpster prior to final packaging.

Whenever contaminated soil and debris are being impacted, the Contractor will ensure that no emissions are generated. UCD’s representative will be on site to monitor the moisture of the soil being skimmed during removal and will ensure that it is adequately wet (and to observe for any visible emissions). An asbestos soil inspector will conduct these visual inspections.

Site management and inspectors will monitor the quantity of surface area disturbed at any given time; also the amount of surface not stabilized will be kept to the minimum quantity necessary for meaningful work to occur. If site conditions change so that dust suppression becomes questionable on the amount of disturbed area, a portion of that area will be stabilized and work will proceed on a reduced area.

If emissions are observed during the removal process, activities will immediately cease and work practices will be reviewed and modified by the Contractor. The Consultant will log all instances where visible dust emissions occurred and immediately notify UCD and CDPHE by phone and in writing, of all occurrences, and will obtain any direction from UCD and CDPHE.

14.5 PPE
During the actual soil disturbance activity, all persons within the designated work area shall utilize appropriate personal protective equipment, including appropriate respiratory protection with a minimum half face respirator with HEPA filtration required anytime active soil disturbance is occurring, protective full body tyvek suit with attached hood and booties, gloves, rubber boots, and other protective wear as appropriate based on conditions (cold stress, heat stress, insects, etc)

14.6 Removal/Excavation
Utilizing an excavator, mini excavator or backhoe with a bucket mounted spray bar system; the soil excavation will proceed within the designated work area. The spray bar system will consist of nozzles inside the back top edge of the bucket and two outside the bucket with nozzles spray pattern overlapping that will provide adequate wetting to
eliminate fugitive dust, but avoid splatter or drift from spraying. Additional hand wetting will be used to eliminate fugitive emissions, but avoid splatter or drift from spraying.

The Contractor will remove adequately wet soil in lifts with the lift thickness is determined by the depth of the adequately wet soil. The application of amended water to work area will be completed in accordance with all applicable regulations, variances, the work plan, and the on-site observations by the Consultant. Polyethylene sheeting will be placed over uncontaminated soils in the swing radius of the excavator or along the transport route of loading equipment to prevent cross-contamination. Care will be taken to avoid contamination of the excavating equipment. This will be accomplished by driving and keeping excavating equipment on non-contaminated soil.

Equipment that comes in contact with contaminated soil, or that was within the designated work area will be decontaminated. Conduct work with appropriate phasing/sequencing that will minimize cross-contamination potential.

14.7 Wind and Work Stoppage Conditions

Soil disturbance operations will not be conducted if winds produce visible emissions of dust or create dust when moving equipment or soil. All wind speed measurements will be taken at locations in close proximity to, and representative of, the work area in which the soil is being handled.

**Shutdown conditions:** Soil removal/disturbance operations will immediately and temporarily cease when one or more of the following 4 conditions have been met:

1. Any wind gust reaching or exceeding 20 mph as determined by hand-held instruments;
2. Sustained wind speeds reaching or exceeding 12 mph averaged over a period of 10 minutes;
3. Winds are producing visible emissions or creating movement of dust or debris in or near the removal/disturbance area, or
4. Winds are impacting on the ability of engineering controls to work as designed.

During wind-related work shutdowns, other work activities not involving soil removal or disturbance (e.g., lining dumpsters) may continue.

**Resume Conditions:** Soil disturbance activities may resume after all of the following 4 conditions have been met:

1. All wind gust readings for a period of 20 minutes drop below 20 mph as determined by hand-held instruments;
2. Sustained wind speeds are below 12 mph averaged over a period of 20 minutes;
3. Winds are no longer producing visible emissions or creating movement of dust in or around the removal/disturbance area, and
4. Winds are not impacting on the ability of engineering controls to work as designed.

14.8 Environmental Monitoring

During the execution of the soil removal, the AMS will collect air samples to assist in determining the adequacy of the engineering and environmental controls employed at the site. Air monitoring will be conducted during ACS significant discovery soil removal activities where visible friable asbestos material is present. All air samples will be collected by a CDPHE certified Air Monitoring Specialist (AMS). The air monitoring is described below.

1. **Sampling Media:** Air samples will be collected by drawing air through a 25-millimeter mixed cellulose ester filter, 0.8-micron pore size, with an open-faced, long cowl using low-flow personal sampling pumps at approximately 2 liters per minute (or flow rate to provide a sufficient LOQ/LOD). Each low-volume pump will be fitted with a computer microchip, which electronically regulates airflow and allows a fixed flow rate of air to pass over the face of the filter. The flow rate and the volume of air passed through the
filter will be determined based on the National Institute for Occupational Safety and Health (NIOSH) 7400 analytical method. Each pump will be calibrated before and after the collection of each sample using a primary standard.

2. Sample Analysis: Sample analyses will be performed by a microscopist using a phase contrast microscope (PCM) according to the NIOSH 7400 Method. The microscopist will be a CDPHE certified Air Monitoring Specialist (AMS) and a participant in the NIOSH Proficiency Analytical Testing Program and have been deemed proficient. Analyses of transmission electron microscopy (TEM) air samples will be submitted to a National Institute for Standards and Technology National Voluntary Laboratory Accreditation Program accredited laboratory using TEM according to Asbestos Hazard Emergency Response Act protocol.

3. The daily air monitoring sampling scheme will be as follows:
   a. Air samples will be strategically placed as close to work area without impeding equipment and worker activity, and will be collected continuously during excavation and loading operations and submitted the same day for PCM analysis. **A total of 8 samples will be collected per shift per work area.**
   b. Of the 8 samples collected, four (4) samples will be arranged at the 4 points of the compass surrounding the work area with two (2) additional samples deemed as “perimeter floating samples”. The perimeter floating samples will be placed in areas where emitted asbestos fibers are most likely to be detected (downwind from work activities). Two potential worst-case scenario “area equivalent” samples will be collected on at least 2 workers who are expected to have the greatest potential exposure to asbestos during abatement operations. The results from these samples are for comparison to 0.01f/cc (and presence of asbestos for when analyzed by TEM) and should not be construed as “OSHA exposure assessment air samples”.

4. Eight (8) samples, including personnel and perimeter samples, will be submitted for PCM analysis. If analysis yields results with detectable fiber levels (based on fiber count) then TEM analysis will be conducted on two (2) highest PCM samples to evaluate engineering controls. After two (2) weeks of TEM sampling, the analytical results and engineering controls will be assessed to determine if adequate controls are in place. If controls are deemed adequate by UCD and CDPHE, the number of TEM samples may be reduced as approved by UCD and CDPHE. On an ongoing project basis, any sample with PCM results exceeding 0.01 fibers/cc must be analyzed by TEM. For large areas of disturbance, additional perimeter monitoring points shall be added if the active area of soil disturbance is larger than approximately 1 acre in size. One additional monitoring point should be added for each additional 200 linear feet of perimeter (approximately 1 sample per additional ¼ acre increase in area). For active areas of soil disturbance greater than 1 acre, additional samples shall be analyzed by TEM at a minimum rate of 25% of the total number of samples collected, based on highest PCM results. However, TEM analysis is not required if PCM results are non-detect (based on fiber count).

5. PCM verbal results will be made available by the start of the next business day or as soon as practical after the start of the next business day. TEM verbal results will be made available within 24-hours of receipt of samples by the laboratory, and written results will be made available within 24 hours from the time the verbal result is received. UCD and CDPHE will be immediately notified if any sample results show any concentration of airborne fibers. If any asbestos fibers are detected by TEM, all investigative activities will be stopped and engineering controls will be evaluated by Contractor and Consultant, and will be discussed with UCD and CDPHE to determine if changes in engineering controls or additional PPE are required.

14.9 Personal Air Monitoring

Air sampling of personnel is an employer based responsibility, and as such shall be the responsibility of each employer associated with soil disturbing activities. The “area equivalent” samples collected on personnel are interpreted as “worst case area” samples and are not intended to provide OSHA exposure information, but can be used by employers for general informational purposes.

14.10 Truck/Container Staging/Lining and Waste Loading

All truck drivers will be instructed to close all windows and shut-off air delivery systems (fans on air-conditioning and heating systems) when entering the loading area. All travel and positioning of waste transport Truck/Trailers on the site should be visually verified clean soil to minimize the need for decontamination procedures. At the loading location, install a ten-mil polyethylene sheeting or thicker “lay-down pad” that will be placed on the ground under
dumpsters/trucks to catch any spilled material. Spilled material will be cleaned up immediately and not allowed to dry out or accumulate. Additional poly shall be draped over trailer tires/fenders to minimize the need for decontamination after loading. After the load has been secured, and the load cover tarp is installed, the poly sheeting lay down loading pad will be properly decontaminated using wet wipe and or HEPA vacuuming methods. The loaded transportation truck may then proceed down the designated exit route.

To accomplish proper characterization of soil (preliminary visual inspection and verification visual inspection at staging area), movement of soil to staging areas for subsequent loading, transportation and disposal is necessary. Staged soil must be stabilized when loading is not occurring. Upon removal of staged ACS placed on “non-ACS area”, the contractor shall remove an additional 12 inches of soil to address any cross-contamination that may have occurred to the non-ACS area.

14.11 Waste Transportation and Disposal

Containers of friable asbestos waste, or asbestos-contaminated soil with visible friable asbestos, shall be labeled, in accordance with the requirements of Section 5.3 of the Solid Waste Regulations. In accordance with the disposal requirements for friable asbestos waste (Section 5.3.5(A) of the Solid Waste Regulations) at least two 6-mil polyethylene liners/sheeting shall be used for soil that contains visible friable asbestos. Polyethylene liners/sheeting should be designed and sized for the container to be used and should be folded over sides of trailers or containers to protect against contamination during loading and to facilitate decontamination. After loading, both liners/sheeting should be mechanically fasted and sealed separately. The liners/sheeting shall be sealed in a manner that ensures that they remain then leak-tight during transportation and disposal operations.

In addition, Department of Transportation (DOT) asbestos placards shall be placed on all four vertical sides of the container or vehicle being used for transport of ACM/ACS. The Contractor should direct the schedule of transportation of asbestos-contaminated soil. When loaded, each truck should be assigned a manifest to serve as the shipping document for that particular load.

Asbestos-contaminated soil shall be transported and disposed in a leak tight container in accordance with the CDPHE disposal requirements. Documentation stating that the soil originating from the site will not be used as daily cover or sold as clean fill shall accompany each load of asbestos-contaminated soil removed from the site.

Disposal of asbestos-contaminated soil will be conducted in accordance with the following requirements, in accordance with Section 5.5.7 of the Solid Waste Regulations:

1. Asbestos-contaminated soils containing visible friable asbestos will be disposed in a leak tight container as friable asbestos waste in accordance with the requirements of Section 5.3 of the Solid Waste Regulations.

14.12 Personnel Decontamination

A fully functioning 3-chamber decontamination trailer (or equivalent) will be placed outside the work zone to function as a remote shower location, with a clean room and an equipment room. All workers involved in removal/packaging of friable or significant quantities of nonfriable ACM will be double suited while in the work area and will shed one suit prior to leaving the work area and immediately proceed to the decontamination facility. All workers will decontaminate per OSHA regulations and CDPHE Regulation No. 8. Decontamination water will be filtered using a 5 micron filter, or in accordance with local requirements if more stringent, prior to disposal to the sanitary sewer.

14.13 Equipment Decontamination

All equipment and tools that come into contact with, or are used for removal of ACS will be decontaminated (free of all visible dust and debris) using wet cleaning (fire hose for trackhoe equipment, wet rags for hand tools, etc) and HEPA vacuuming methods (interior of equipment cab, etc), prior to leaving the work zone. Equipment decontamination will be conducted within a decontamination station constructed adjacent to the work zone. The
decontamination station will be constructed of 10-mil polyethylene sheeting (and other materials as necessary, such as EPDM rubber roofing, etc) in such a way as to capture all contaminated material and wastewater from the decontamination process. All waste water from the decontamination station will be filtered to a minimum of 5-microns (or in accordance with local requirements if more stringent, prior to discharge to a sanitary sewer), or may be used for wetting ACS.

14.14 Final Inspection Procedures

As the project progresses, visual inspection will be performed to ensure that all observable asbestos-containing materials have been removed from the soil surface. During removal of soil, the soil will be removed in a manner that will provide a flat, even surface (with no spoil piles) for visual inspection. The inspections will be performed for the surface area removed that day, as a preliminary inspection. Due to the wet nature of the removal and the soil, adequate drying time is required before a final visual inspection can be conducted.

The removal of soil in the debris field area will be considered complete when the visible asbestos-containing material has been removed and an asbestos soil inspector makes a final decision that all contaminated soil in the debris field has been removed to depth and extent of excavation (where remaining visible material will be covered with a membrane and labeled), or depth of find plus 1 foot of soil (DOF+1) and extent of find plus 1 foot of soil (EOF+1).

14.15 Managing ACS left in place

Where visible asbestos containing material is observed at the depth and extent of excavation, 1 additional foot of soil shall be removed, the area shall be covered with a geotech membrane, labeled as asbestos contaminated soil, and then the membrane shall be covered with 1 foot of clean fill to bring back to desired grade/level. Prior to covering with clean fill, photographs will be collected from each compass point of the boundary, and the corner points of the boundary shall be obtained using measurements for a control point or with a GPS device.

14.16 Spill Control

Where asbestos contaminated soil is spilled during loading or transport, the Contractor shall immediately ensure the spilled material is immediately collected in accordance with wetting and emission control provisions of this SCMP. For spills that occur on clean soil, remove 12 inches of soil under spill area as precautionary measure. For spills that occur on hard surfaces such as asphalt roadways or concrete parking lots, provide wet cleaning and HEPA vacuuming until all visible dust and debris have been removed.

Where water run-off occurs resulting in visible erosion and sediment transfer from asbestos contaminated soil areas to non-asbestos contaminated soil areas, remove top 12 inches of soil where the visible erosion and sediment deposition occurred.

14.17 Erosion Control

To control wind erosion of ACS, use of silt fencing or wind fencing may be used, where appropriate. Stabilize asbestos containing soil with friable debris by covering with magnesium chloride (or equivalent soil stabilizer) or 6-mil poly until removal can occur. Securely fasten poly sheeting to prevent removal by the wind.

To control water erosion, the use of silt fencing, erosion control mats, straw waddles or equivalent erosion control methods shall be used in areas where run-off is likely. Where ACS will remain, cover with geotech membrane, and then cover with 12 inches of clean fill and cover with appropriate vegetative growth or ground cover to prevent erosion.
15 Special Considerations

15.1 Emergency Buried Utility Repair Projects

Specific provisions of this SOP require some planning and response time that may not be appropriate in an emergency response situation to repair a buried utility. This section identifies the minimum requirements under this SOP for the first 24 hours of excavation and repair, to ensure that necessary repairs can be made to buried utilities promptly in an emergency situation where the utility must be repaired immediately (which may include evening and weekend work), where ACS is encountered during the emergency response, only worker protection, adequate wetting and no visible emission provisions of this SOP will apply within the first 24 hours, with remaining provisions including material characterization, soil training, air monitoring, disposal, etc to take effect after the first 24 hours of the excavation and repair. By ensuring adequate wetting and no visible emissions during emergency excavation during the first 24-hours, this will allow necessary work to continue, and will provide a window for implementing remaining provisions of this SOP including testing of suspect materials and where ACS is identified, and for implementing management actions under this SOP. Where suspect material is identified in soil that has been excavated during the emergency repair, this soil shall not be placed back into the hole/pit until characterization can be conducted by an asbestos soil inspector.

15.2 Importing and Exporting Soil

The Contractor shall notify and receive approval from the UCD project manager prior to any soil being exported or imported to the project. Contractor shall coordinate any inspections, spotting, or testing requested by the UCD project manager for any exported or imported soils to the project.

15.3 Building Demolition Debris Removal Verification

To ensure demolition debris is removed during the demolition phase in accordance with applicable regulations, an asbestos soil inspector will conduct a site inspection during the final stage of demolition to determine if all demolition debris has been removed. As a precautionary measure, as part of the final demolition site cleaning, a layer of clean soil should be removed to ensure no construction debris remains upon completion of the demolition process as verified by inspection by an asbestos soil inspector, with the exception of non-asbestos-containing/contaminated “structural” fill such as concrete and brick as approved by UCD.

15.4 Soil Stockpiling Management Procedures

Stockpiling of asbestos contaminated soils will only occur under CDPHE and UCD approval, as removal of contaminated soil will be under a direct load approach unless otherwise approved by UCD and CDPHE. When soil movement and stockpiling is necessary, based on site logistics, stockpiled soil must be stabilized and covered when not in use, and must not be allowed to remain on site longer than 5 working days.

For excavation and stockpiling of non-asbestos contaminated soils that are subject to “soil spotting provisions” (moderate to high potential ACS), an asbestos soil inspector will be present at all areas where stockpiled soils are placed, and will be in radio communication with the asbestos soil inspector inspecting soils at the excavation point to ensure prompt and efficient response to discovery of visible ACM debris at either location.

15.5 Management Practices for Significant Discovery of only Nonfriable materials

Where only nonfriable materials are observed (no friable debris) in a significant discovery “debris field”, the following are required procedures:

1. Ensure material and soil is adequately wet and no visible emission occur during excavation and loading activities.
2. Packaging and disposal as nonfriable asbestos containing waste material.

15.6 Soil Sampling

The primary method for determining asbestos contaminated soil under this SOP and under CDPHE HMWMD regulation is visual identification of suspect material that is confirmed or presumed to be asbestos. Soil sampling is considered an optional activity and will be conducted only with UCD written authorization to conduct soil sampling on the campus. There are two primary situations where UCD may authorize soil sampling:

1. Soil sampling to provide general information about imported or exported soils as part of the management procedures under the SOP.
2. UCD written authorization to conduct soil sampling in conjunction with “Remediation” actions (as provided in Attachment #5) conducted to remove the full extent and depth of asbestos contaminated soil from a specified area. Remediation soil sampling may include “baseline” characterization for soil sampling collected prior to a remediation action, and will include collection of “clearance” (post-removal) soil sampling to verify removal of all asbestos (including trace amounts in soil as determined by PLM analysis).

Refer to Attachment #4 for surface soil sampling and analysis procedures.

15.7 Remediation

If the objective of an ACS removal activity is remediation of a specific location to remove the complete extent and depth of asbestos in soil at a specific location, including trace in soil as determined by PLM analysis, or for the purpose of obtaining a no further action determination under some other regulatory framework, such work must be in accordance with the remediation plan provided as a supplement to this SOP in Attachment #5. The remediation plan integrates the sampling and analysis plan (SAP) provided in Attachment #4 and describes soil handling and soil clearance (visual and bulk sampling) criteria. Refer to Attachment #5 for surface remediation procedures.

16 Project Reporting

Upon completion of soil disturbing activities, to aid in future management of site and any remaining ACS conditions known to exist, a close out report will be provided to the UCD to document work performed, and any ACS material known to exist that will remain for management.

The project close-out report shall include the following minimum components:

1. Property description and description of areas with asbestos-contaminated soils
2. Description of soil disturbing activities involving ACS (emission control procedures) and non-ACS conditions
3. Description of all field operations or daily logs
4. Containment logs (where appropriate)
5. Air Monitoring logs and analytical results associated with ACS removal actions
6. Description/results of all asbestos bulk sampling events, including sample locations descriptions and sample diagram/drawing showing sample locations
7. Analytical results associated with bulk sampling events
8. Disposal summaries and manifests
9. Maps showing excavation profiles
10. Documentation of asbestos left in place including drawings, photographs and GPS coordinates for corner points of known ACS.
11. Photographs showing pre-, during and post excavation/removal conditions
12. Accreditation and Certification documentation for activities covered under the Work Plan (Inspector, Air Monitoring Specialist, Supervisor, and Worker)
17 SOP Review and Revision

17.1 SOP Review
Annually, the UCD Facilities Planning Department contact and UCD Environmental Health and Safety Division contact as provided in Section 3 of this SOP shall review this SOP with an asbestos accredited/certified Project Designer with 6-month asbestos soil experience to identify any needed revisions to this SOP.

17.2 SOP Review
Based on annual review, any revisions to the SOP shall be submitted to CDPHE as a “revised” SOP with a new revision number and revision date for CDPHE review and approval.

18 Attachments
Attachment #1  ACS Classification and AMC Boundary Drawing (and Site Survey Drawings)
Attachment #2  Historical Buildings and Steam Tunnels Site Drawing
Attachment #3  SOP Flow Chart
Attachment #4  Soil Sampling and Analysis Plan (SAP)
Attachment #5  Remediation Plan
Attachment #6  CDPHE Notification Summary and Notification Forms
ATTACHMENT 1

ACS CLASSIFICATION AND AMC BOUNDARY
SITE DRAWING AND SITE SURVEY DRAWINGS
ATTACHMENT #2

HISTORICAL BUILDING AND STEAM TUNNEL
SITE DRAWING
ATTACHMENT #3

SOP FLOW CHART
ATTACHMENT #4

SOP SUPPLEMENTAL PROCEDURES
SOIL SAMPLING AND ANALYSIS PLAN (SAP)

General

1. Sample aliquots should be collected using a scooping device (stainless steel spoon or equivalent), and transferred to a composite sample container.
2. When all aliquots have been collected, the composite sample container should be sealed and labeled with a sample number unique to the boring from which the sample was collected. The sample should be homogenized by the laboratory prior to analysis.
3. A field sampling form or log book entry should be maintained for each sample. The form or log book entry should contain the location, date and time of each sample, a description of the type of and friability of any suspect material encountered, and any observations made during sample collection.
4. Proper chain-of-custody protocols should be followed for all samples collected.

Analytical Procedures

1. Soil samples should be analyzed by PLM for bulk asbestos samples (Method – EPA/600/R-93/116). The samples should be homogenized by the laboratory prior to sample analysis.

Surface Soil Sampling

1. Divide the area to be inspected into a grid, using stakes or paint to mark grid nodes. The area of each grid square will be determined based on the size of the site, and existing knowledge of the extent and concentration of surface asbestos;
2. Grids are (50’ x 50’) on an X and Y axis utilizing planned north with the south west corner of each grid being the reference point for each grid site wide. X axis designation is numerical and Y axis grid designation is alphabetical.
3. Each grid point is identified in the lower left (Southwest) corner with a 48” wood lathe with pink ribbon alpha numerically (i.e. B15, CA12).
4. Sub-grids (25’ x 50’) rectangle grids within each (50’ x 50’) grid are identified with pin flags alpha numerically (i.e. B15-1, CA12-2).
5. Where grids extend beyond a scope of work boundary and/or property boundary, this boundary will be designated with a string line to delineate scope in partial grids (where grids overlay on scope of work or property boundary).
6. Using flags, paint or GPS, mark locations of any suspected asbestos found;
7. Record locations of suspected asbestos found using a map, log or other documentation. The absence of asbestos in a grid square will also be documented;
8. Place suspected asbestos material in a sample bag, adequately wetting it prior to disturbing it; and record time and date, location and description of material collected.
9. A composite aliquot soil sample will be collected within each sub-grid 1,250 square feet (25’ x 50’) by an asbestos soil inspector. The asbestos soil inspector will collect ten aliquots of surface soil (top 1 inch) within each sub-grid. Two sample aliquots will be collected from the southwest quadrant, southeast quadrant, northwest quadrant, northeast quadrant, and the relative center of
the sub-grid (totaling ten aliquots per sub-grid). A grid will be considered an asbestos contaminated soil grid where soil sampling data reports the presence of asbestos in any sub grid within that grid (thus progressive analysis may be used to create sample sets for each grid, with a positive stop used where analysis shows asbestos present (eliminating the need to analyze the second sub grid).

10. Samples will be placed in a sample jar, labeled, and location, time, date will be documented.

11. The sample will be homogenized at the laboratory;

12. Follow proper chain of custody protocols.

Subsurface Soil Sampling - Borings

1. A composite sample should be collected from each soil boring. The sample should be made up of five (5) to ten (10) aliquots representative of the soil boring. The actual number of aliquots may vary depending on the depth of sampling and the conditions observed.

Subsurface Soil Sampling – Potholes and Trenches

1. Collect a composite sample made up of five (5) to ten (10) aliquots representative of the soil encountered in the trench or pothole. The actual number of aliquots may vary depending on the depth of sampling and the conditions observed. In addition, it may be warranted to collect separate samples from various strata, with aliquots collected from individual strata, to better characterize observed conditions.

Informational Soil Samples for Imported/Exported Soil

1. The asbestos soil inspector will collect composite samples comprised of 10-point aliquots from 10% of the total number of loads dumped (for imported soils) and/or loaded (for exported soils). Soils sampled for informational purposes shall be managed in an appropriate manner (stockpiled by day, area, etc) to allow appropriate management of soil based on soil sampling data. All soil samples will be submitted to an accredited laboratory for PLM analysis on a “rush” turnaround.

Interpretation of Sampling Data

1. Samples reporting no asbestos detected shall be interpreted as non-ACS, and samples reporting the presence of asbestos shall be considered ACS.
ATTACHMENT #5

SOP SUPPLEMENTAL PROCEDURES
REMEDIATION PLAN

Where the intent is to remediate (removal all visible debris and asbestos in soil to a concentration of no asbestos detected in the soil, based on soil sampling), the following supplement to the SOP provides specific remediation provisions.

The following provisions identified in Section 12 of the SOP shall apply to ACS surface soil remediation (soil removal, packaging, transportation and disposal) procedures:

- Notifications Planned Asbestos-contaminated Soil Disturbance
- Limited Quantity Discovery Management and Disposal
- Site Control, Demarcation, Fencing and Wind Screening
- Protection of Adjacent Structures
- Soil Wetting and Stabilization
- Dust and Emissions Control
- PPE
- Equipment/Engineering Controls
- Removal/Excavation
- Soil Stockpiling
- Wind and Work Stoppage Conditions
- Environmental Monitoring
- Personal Air Monitoring
- Truck/Container Staging/Lining and Waste Loading
- Waste Transportation and Disposal
- Personnel Decontamination
- Equipment Decontamination
- Final Inspection Procedures

All ACS identified based on visual characterization (extent and depth) of find, shall be removed plus an additional 12 inches of soil beyond the extent of find (EOF) and 12 additional inches beyond the depth of find (DOF) which identifies the 3-dimension box of soil removed under the remediation.

After removal to EOF and DOF based on visual and preliminary soil sampling data, post remediation “surface clearance” soil sampling will be conducted in accordance with the Soil Sampling and Analysis Plan (Attachment #4) of this SOP, on a grid by grid basis. Any grid reporting the presence of asbestos will be considered to have “failed” and will require removal of additional twelve (12) inches of soil, and the “clearance process will be repeated until “no asbestos detected” is reported for that grid, after which that grid will then have deemed to “pass”. Once all grids in the delineated area have been characterized, remediated, and passed “clearance soil testing”, the remediation action will be considered complete.
April 28, 2010

Mr. Ken Neeper
Manager Infrastructure Development
University of Colorado Denver
Mail Stop F418
1945 North Wheeling Street
Aurora, CO 80045

RE: Asbestos-Contaminated Soil (ASC) Management, Standard Operating Procedure (SOP) Document,
University of Colorado Denver Anschutz Medical Campus, February 26, 2010

Dear Mr. Neeper,

The Colorado Department of Public Health and Environment, Hazardous Materials and Waste
Management Division (the “Division”), has received and reviewed the above referenced standard
operating procedures for the proper management of asbestos-contaminated soils during soil disturbing
activities at the Anschutz Medical Campus of the University of Colorado Denver. The Anschutz
Medical Campus is located on the site of the former Fitzsimons Army medical Center in Aurora,
Colorado. The Division has no additional comments and hereby approves the Anschutz Medical
Campus ACS Management SOP Document.

If you have any further questions or comments please contact me at 303-692-3416 or via e-mail at
jeffrey.swanson@state.co.us.

Sincerely,

Jeffrey R. Swanson, P.E.
Federal Facilities Restoration and Reuse Unit
Remedial Program

CC:  Tom Butts, Walsh Environmental Scientists and Engineers
     Monica Sheets, CDPHE
     Rob Eber, AGO
     File Copy: RD007-13.1
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 except use Category UC3b for exterior construction and use Category UC4a for items in contact with the ground.
      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. Framing less than 18 inches above ground in crawlspaces.
      d. Floor plates installed over concrete slabs-on-grade.

C. Fire-Retardant-Treated Materials:
   1. Exterior type for exterior locations and where indicated.
   2. Interior Type A, High Temperature (HT) for enclosed roof framing and where indicated.
   3. Interior Type A unless otherwise indicated.

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 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 EXTENDED WARRANTY: Provide a written two-year warranty, signed by Contractor and sealant installer, guaranteeing all exterior joints and interior joints detailed within the Vivarium to be water and air tight for a period of not less than two (2) years from date of the Letter of Acceptance of the Work by the University.
1. Exception: Provide 20 year warranty period from date of the Letter of Acceptance of the Work by the University for sealants used in BSL3 only.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
1. Use: For joints in vertical surfaces.
2. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 790.
   b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
   c. Tremco Incorporated; Spectrem 1.

B. Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade P, Class 100/50, for Use T.
1. Use: For joints in horizontal traffic surfaces.
2. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 890-SL.
   b. Pecora Corporation; 300 SL.
   c. Tremco Incorporated; Spectrem 900 SL.

C. 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 - Silicones; Sanitary SCS1700.
   d. Tremco Incorporated; Tremsil 200 Sanitary.

D. 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.

E. 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.
F. 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

A. SPECIAL INSTALLATION REQUIREMENTS AT VIVARIUM AND CORE LAB: Provide the following for the Vivarium complete and the BSL3 Core Lab. Provide mildew-resistant sealant listed above at all conditions listed below:

1. Ceilings: Fully seal all joints at access panels, light fixtures, electrical devices, mechanical devices, fire protection devices, etc.
2. Walls: Fully seal all joints, including but not limited to, joints between finished wall surface and door and window frames, power boxes, plug mold, wire mold, alarm and sensor boxes, access panels, electrical devices, plumbing devices, mechanical devices, fire protection devices, wall bumper mounting plates, wall plates, wall-mounted equipment, window sills and jambs, etc.
3. Wall and Ceiling Penetrations: Completely seal all penetrations, including but not limited to, joints between finished surface and electrical conduits, electrical plugs and switches, light fixtures, cover plates, piping for water, gas, vacuum, gas, soil and waste lines, mechanical ducts, registers, etc.
4. Sealant is not required at inside corners of wall-to-wall and wall-to-ceiling joints in drywall construction or as a filler in preformed metal control and expansion joints in drywall construction.

END OF SECTION 07 92 00
SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL (Not Applicable)

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:
   1. Ceco Door Products; an Assa Abloy Group company.
   2. Curries Company; an Assa Abloy Group company.
   4. Steelcraft; an Ingersoll-Rand company.
   5. Any current member in good standing of the Steel Door Institute (SDI).

2.2 INTERIOR DOORS AND FRAMES

   1. Edge Construction: Model 2, Seamless.
   2. Core: Manufacturer's standard.
   3. Frames: Face welded.

2.3 EXTERIOR DOORS AND FRAMES

   1. Edge Construction: Model 2, Seamless.
   2. Core: Manufacturer's standard, insulated.
   3. Frames: Face welded.

2.4 FABRICATION

A. Preparation for Finish Hardware:
   1. Doors and Frames: Spot weld all reinforcement at the factory. Drill and tap for mortise template hardware.
   2. Frame Reinforcement: Comply with ANSI/SDI A250.6 and the following:
      a. Hinges: 7 gage plate, 12 inches long by full width of jamb at each hinge.
      b. Lock: 12 gage.
      c. Strikes, Flush Bolts, and all other Surface Mounted Hardware: 12 gage.
      d. Closer: 10 gage channel section, 12 inches long and full width of frame trim.
   3. Door Reinforcement: Comply with ANSI/SDI A250.6 and the following:
      a. Hinges: 7 gage, 9 inch long, welded to 16 gage interior edge channels at each hinge.
      b. Closers: 12 gage box section minimum 4 inch deep and 12 inch long.
      c. Locksets, Deadbolts, Panic Devices: 12 gage.
      d. Pull Plates, Flush Bolts, and Surface Mounted Hardware: 12 gage.

B. Frame Anchors:
   1. Frames up to 7 feet tall: 3 anchors per jamb.
   2. Frames greater than 7 feet and less than 8 feet tall: 4 anchors per jamb.
   3. Frames greater than 8 feet tall: 1 additional anchor for each 2 feet or fraction thereof in height per jamb.
PART 3 - EXECUTION (Not Applicable)

END OF SECTION 08 11 13
SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements:
   1. Provide solid-core doors only; hollow-core not permitted.
   2. Flush wood doors permitted for interior use only; exterior wood doors are not permitted.
   3. In new construction use close-grained wood veneer; in existing buildings match existing doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:
   1. Algoma Hardwoods, Inc.
   2. Eggers Industries.

2.2 MATERIALS, GENERAL

2.3 DOOR CONSTRUCTION, GENERAL

A. Quality Standard: WDMA I.S.1-A.

B. WDMA I.S.1-A Performance Grade:
   1. Heavy Duty unless otherwise indicated.
   2. Extra Heavy Duty: Classrooms, public toilets, janitor's closets, assembly spaces, and exits.

2.4 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:
   1. Grade: Premium, with Grade A faces.
   2. Species: Close-grained.
   3. Cut: Plain sliced (flat sliced) or quarter sliced.
   4. Assembly of Veneer Leaves on Door Faces: Center-balance match.
   5. Core: Particleboard.
   6. Rails and Stiles: LSL, adhered to core.
   7. Construction: Five or seven plies, bonded.

2.5 DOORS FOR OPAQUE FINISH

A. Interior Solid-Core Doors:
   1. Grade: Premium.
   2. Faces: Medium-density overlay.
   3. Core: Particleboard.
   4. Construction: Five or seven plies, bonded.
2.6 PRIMING/FINISHING

A. Shop Priming:
   1. Doors for Opaque Finish: One coat of wood primer.

B. Factory Finishing: Doors indicated to receive transparent finish.

C. Transparent Factory Finishes:
   1. Grade: Premium.
   2. Finish: Catalyzed polyurethane.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Seal top, bottom, and edges of doors immediately after fitting.

B. Through-bolt (barrel bolts) door closers and exit devices.

END OF SECTION 08 14 16
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.
      a. Basis-of-Design Exterior Glazing: Viracon, VE1-2M.
   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. AFG Industries, Inc.
   2. Guardian Glass.
   4. PPG Industries.
   5. Viracon.

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. Design Requirements:
1. Interior design color palette proposed by the Design Professional must meet all criteria established with input and approval by the University Campus Architect through the University Project Manager.
2. Provide rubber base at both carpet and resilient flooring installations. Upgrades are permissible with approval of the University Campus Architect through the University Denver Project Manager.
3. All penetrations and/or seams in materials in BSL3, Vivaria, and other similar functional areas are to be sealed, unless otherwise noted.

B. 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, extend partition 6” above the ceiling grid and 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. Partitions Enclosing Pressurized Mechanical Rooms: Provide metal framing systems of base-metal thickness and spacing capable of limiting lateral deflections to L/240 when subjected to a 15 psf uniform lateral load or the design value induced by the mechanical system, whichever is greater.
   3. 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.
   4. 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
SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements
   1. Design all walls within a vivarium to have a sound transmission class (STC) rating of 55 or better.

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. Exterior Gypsum Board for Ceilings and Soffits:

C. Tile-Backing Panels:
   1. Glass-mat, water-resistant backing board.

D. Trim Accessories:
   2. Exterior: Hot-dipped galvanized steel sheet or rolled zinc.

E. 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, comply with recommendations in GA-214, “Recommended Levels of Gypsum Board Finish.”

END OF SECTION 09 29 00
SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirement:
   1. Provide patterns, colors and finishes approved by the University Campus Architect through the University Project Manager.

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: Type III, Form 1, nodular; sag resistant with anti-microbial treatment.
   3. Type and Form for Laboratories: Type IV, mineral base with membrane overlay; Form 2, water felted; with fiberglass-fabric face; sag resistant with anti-microbial treatment.
   5. LR: Approximately 0.90.
   6. NRC: Approximately 0.70.
   7. CAC: Approximately 35.
   8. Thickness: 3/4 inch.
   9. Modular Size: 24 by 24 inches or 24 by 48 inches scored to look like 24 by 24 inches.

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.
h. Miscellaneous Mechanical Items: Gray.

PART 3 - EXECUTION

3.1 INSTALLATION


END OF SECTION 09 51 13
SECTION 09 61 19 - VAPOR EMISSION AND ALKALINITY CONTROL FLOORING TREATMENT

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements
   1. Test all concrete substrates scheduled to receive moisture sensitive flooring.
   2. Provide vapor emission and alkalinity control flooring treatment at all concrete substrates which fail testing criteria indicated in Section 09 00 00 “Finishes” of this guideline.
   3. In Section 01 21 00 “Allowances” specify a quantity allowance for the provision of vapor emission and alkalinity control flooring treatment equal to 35 percent of all concrete substrates scheduled to receive moisture sensitive flooring.
   4. In Section 01 20 00 “Unit Prices” require that Contractor provide a unit price bid on a per square foot basis for the provision of the specified vapor emission and alkalinity control flooring treatment including floor preparation and installation complete.

PART 2 - PRODUCTS

2.1 MOISTURE-RESISTANT FLOORING TREATMENT

A. Products: Subject to compliance with requirements, provide one of the following:
   1. Ardex Engineered Cements; ARDEX MC, Moisture Control System.
   2. Floor Seal Technology, Inc.; Moisture Reduction System, MES 100.

B. System Description:

   1. Two component resinous treatment system, VOC compliant, low viscosity and elastomeric properties to expand and contract with limited slab movement. Formulated to saturate concrete surfaces and mechanically restrict moisture and alkalinity levels.

C. System Physical Properties: Provide resinous flooring treatment with the following minimum physical properties when tested according to test methods indicated:

   1. Water Vapor Transmission: Varies, 94% reduction per ASTM E 96.
   2. Alkalinity Resistance: Passes up to a pH of 14 per ASTM D 1308.
   3. Adhesion Strength: 500 psi minimum per ASTM D 4541.
   4. Relative Humidity Resistance: 100% per ASTM F 2170.
   5. VOC: Less than 100 g/L per SCAQMD Rule #1113.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Scarify slab surface in area of application by shot blasting or other method acceptable to coating treatment manufacturer.

B. Apply coating in strict compliance with manufacturer’s installation instructions.

END OF SECTION 09 61 19
SECTION 09 65 00 - RESILIENT FLOORING

PART 1 - GENERAL (Not Applicable)

PART 2 - PRODUCTS

2.1 RESILIENT BASE AND ACCESSORIES

A. Resilient Base:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Johnsonite.
      b. Musson, R.C. Rubber Co.
      c. Roppe Corporation, USA.
   3. Style: Cove at all locations.
   4. Minimum Thickness: 0.125 inch.
   5. Height: 4 inches.

B. Resilient Molding Accessory: Rubber.
   1. Edge Strips: 0.125 inch thick, 1 inch wide, with tapered or bullnose edge.

C. Abrasive Strips: Self-adhesive, 1 inch wide, with aluminum oxide grit.

2.2 RESILIENT TILE

A. Vinyl Composition Floor Tile:
   1. Class: Through pattern.
   2. Wearing Surface: Smooth.
   3. Thickness: 0.125 inch.
   4. Size: 12 by 12 inches.

2.3 RESILIENT SHEET FLOORING

A. Vinyl Sheet Floor Covering: ASTM F 1303, Type I, Grade 1, with Class B backing.
   1. Thickness: 0.080 inch thick.
   2. Wearing Surface: Smooth.
   3. Sheet Width: As standard with manufacturer.
   4. Seaming Method: Heat welded at medical labs (BSL2); standard otherwise.

B. Linoleum Floor Coverings:
   1. Sheet Flooring: In manufacturer's standard length by not less than 78 inches wide.
   2. Seaming Method: Heat welded at medical labs (BSL2); standard otherwise.
   3. Thickness: 0.08 inch.

2.4 INSTALLATION MATERIALS

1. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based provided or approved by manufacturer for applications indicated and capable of taper to feather edge.
2. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
3. Floor Polish: Provide stripper, sealer and polish recommended by the University Environmental Health and Safety (EHS) through the University Project Manager.

PART 3 - EXECUTION

3.1 CLEANING AND PROTECTION

A. Floor Polish: Strip factory seal and apply finish recommended by the University EHS through the University Project Manager.

END OF SECTION 09 65 00
SECTION 09 68 13 - TILE CARPETING

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 two 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: Refer to Section 01 78 46 – Extra Stock Materials.

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. Include carpet product installed on stairs in warranty provided it is properly installed and maintained.

E. 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 10% loss of pile fiber weight
2. Excessive Static Electricity: More than 3.5 kV per AATCC 134; 3.0 kV in areas of heavy electronic usage
3. No Delamination
4. No Edge Ravel
5. No Zippering

F. Provide an additional warranty for a minimum non-prorated period of two years and cover against shrinkage, cupping, and doming.

G. Tuft Bind warranty in lieu of edge ravel and zippering is not acceptable.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. CARPET

1. Nylon Fiber: Fiber must be premium branded nylon. Mill extruded nylon will not be accepted. 100% type 6,6 bulk continuous filament (BCF) nylon. Hollow filament fiber shape for optimal soil hiding capability. A modification ratio of less than 1.5. Polymer identification to AATCC TM 20.
2. Construction: Texture - level loop or textured loop with maximum pile height variation of 1/32 inch.
4. Pile Density: Minimum 5500 for heavy or severe traffic.
5. Dye Method: Fiber to be minimum 75% solution dyed; 95% preferred.
6. Stain Resistance: AATCC TM 171 (HWE) for 2 cleanings to simulate removal of topical treatments by hot water extraction, followed by AATCC TM 175 Stain Resistance test; minimum rating of 8 using AATCC Red 40 Stain Scale.
7. Soil Resistance: Soil resistance treatment to be heat cured by mill during manufacturing process.
8. Coloration/Patterning: Minimum five (5) color hues. Recommended: Hue values to be in medium to medium-dark range with random or complex patterning for optimum soil hiding capability. Restrict solid color carpet to accent areas. Do not use light colors.

2.2 BACKING CHARACTERISTICS
1. Primary Backing: Synthetic Woven or Non-Woven.
2. Pre-Coat (Fusion Coat): Sealant Vinyl
3. Secondary Backing: Vinyl Closed Cell. 100% reclaimed-content, nylon reinforced vinyl matrix backing is preferred and should be provided if available.
   a. High performance, moisture impermeable modular, vinyl
   b. 24” x 24”, or 60cm, or 36” x 36”

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 (must pass Methenamine Pill test, ASTM D2859 test method)
   3. Smoke Density: ASTM E-662 / NFPA 258; < 450 Flaming Mode(or to State Code)
   4. Electrostatic Propensity: AATCC TM 134 (Step & Scuff): 3.5 kV or less by permanent means (i.e. antistatic filaments) and without chemical treatment. 3.0 kV in areas of heavy electronic usage
   5. Static Coefficient of Friction : ASTM C-1028: Passes ADA Requirements for Accessible Routes (minimum 0.60)
   7. Dimensional stability: Aachen method/ ISO 2551. Maximum change +/-0.20%
   9. Colorfastness to Light: AATCC TM 16.3 to 200 AFU; minimum rating 3-4 using AATCC Grey Scale for color change.
   10. Colorfastness to atmospheric contaminants: AATCC TM 164 (resistance to fade from oxides of nitrogen) and AATCC TM 129 (resistance to fade from ozone) for 2 cycles; minimum rating of 3-4 using AATCC Gray Scale for Color Change.
   11. Colorfastness to crocking: AATCC TM 165, minimum rating of 4 using the AATCC Chromatic Transference Scale.Texture Retention: Vettermann Drum: ASTM D-5417: Minimum 3.5 @ 22,000 cycles or Hexapod Test Method, ASTM D5252, for 12,000 cycles (8.4 lb tumbler) with a minimum rating of a 3.5 Rating using the appropriate Commercial Reference Scale for the construction per ASTM D7330 test method. Testing without underpad or brushing.
   12. Moisture Barrier: Moisture Penetration by Impact Test: No penetration of backing after 10,000 impacts @ 10 psi.

SUSTAINABILITY
13. NSF/ANSI 140 the Sustainability Assessment for Carpet.
   a. VOC Chamber Testing
      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.

2.4 SUBSTITUTES/ALTERNATES
A. Subject to compliance with all requirements, “or equal” must match the selected colors, have similar aesthetic, and meet performance criteria. Substitution sample and submittals to be considered must be
submitted for written approval of quality and color in accordance with bidding documents. Sample of proposed substitute must be inclusive of both the face and proposed backing (color-only sample not acceptable).

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 72 00 - WALL COVERINGS

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Design Requirements
   1. Vinyl Wall Covering:
      a. Vinyl wall covering must be approved for desired location through the University Project Manager. The surface should be smooth and resistant to high alkaloid cleansers.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vinyl Wall Covering: Type II, Medium or Type III, Heavy Duty per FS CCC-W-408D and CFFA-W-101D, mildew resistant and with stain-resistant coating.
   1. Strippable, complying with ASTM F 793 for one of the following:
      a. Category IV, Type I, Commercial Serviceability
      b. Category V, Type II, Commercial Serviceability
      c. Category VI, Type III, Commercial Serviceability.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 09 72 00
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 BLOCK FILLERS

A. Block Filler, Acrylic/Latex, Interior/Exterior for Concrete Masonry Unit Substrates: MPI #4

2.2 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.

2.3 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
2.4 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.

2.5 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.

2.6 FLOOR COATINGS

A. Sealer, Water Based, for Concrete Floors: MPI #99.

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
PART 1 - GENERAL

1.1 DESIGN REQUIREMENTS

A. Branch Circuit Requirements:
1. Corridor receptacle circuits shall not be combined with office or laboratory receptacle circuits.
2. Housekeeping receptacle circuits shall not be combined with office or laboratory receptacle circuits. Provide separate housekeeping receptacles in laboratory Linear Equipment Rooms, clearly identified by an Orange duplex receptacle.
3. Offices shall have individual dedicated circuits as required for specific equipment. A maximum of 6 general purpose receptacles per 20A circuit is allowed.
4. Connect Laboratory receptacles in "Multi Outlet Assembly" (MOA) to alternating circuits (i.e. A, B, C, A, B, C). A maximum of 4 receptacles per 20A circuit is allowed.
5. Provide countertop receptacles in Laboratories with maximum two (2) foot on center spacing. Each outlet within 6 feet of a sink edge or water source shall be GFCI type. Protection via feed-thru GFI or GFCI breaker is not allowed.
6. Provide general receptacles in corridors no further than 50’ apart.
7. Laboratory freezers such as -80 degree Celsius or similar equipment shall be provided at minimum with a dedicated 120V, 20A single 5-20 receptacle or as required per equipment. All receptacles shall be RED and connected to an emergency circuit.
8. Provide dedicated neutral conductors for all circuits.

B. Design Charette:
1. Design team shall schedule a Design Charette with the University Project Manager and facilities group at 100% Design Development phase and 50% Construction Document phase.
2. Charette shall include the following:
   a. Electrical power distribution, including service entrance, standby system, riser closet locations and layouts.
   b. Lighting design, including fixture layouts, egress lighting, fixture types, samples of specialty fixtures, accessibility for fixture maintenance and lighting controls.
   c. Fire alarm design, including occupancy type, sequence of operations and interface with security systems.

C. Surge Suppression:
1. Provide integral Transient Voltage Surge Suppressors at the following locations:
   a. Main Service Switchboards and Switchgear
   b. Computer Laboratory Panel Boards
   c. Information Services Panel Boards.
   d. NMR Panelboards

D. Exterior Electrical Equipment:
1. Provide 15’ minimum clearance around generators for maintenance access.
2. Provide ventilation for primary switching and exterior substations. Maintain positive elevation for exterior electrical equipment to protect against wet weather.
3. Provide exterior connections to a portable 500 kW generator for each building not provided with an emergency generator system. Provide kirk-key interlock for operation of generator system.

E. Provide a complete Lightning Protection System for each building.

F. Demolition:
1. Demolish all devices, conduit, wiring and associated equipment which do not remain in a remodel.
2. Completely remove all conduit, wiring, boxes, hangers, etc. back to the source.
3. Abandoned devices and equipment are not acceptable.
4. Recycle or dispose of all demolished items at a licensed facility.

G. Animal Facilities:
   1. Provide redundant feeders to all distribution boards serving animal care facilities.
   2. Provide 100% generator backup power for all systems serving the animal care facilities.
   3. Provide all power and communication devices with weather proof covers. Mount devices at 42” AFF. Mount all devices in office areas at standard height without weather proof covers.
   4. Provide cord reel centered in the ceiling between each row of cages.
   5. Sharing power circuits between holding rooms is not acceptable.
   6. Silicone seal all conduit wall penetrations. Internally seal all conduits after wiring has been pulled.
   7. Provide emergency power off (EPO) capabilities for all branch feeders serving sterilizers. Locate EPO switch near the exit door, away from sterilizer.

H. Routing of electrical busway through chemical storage rooms is not acceptable.

I. Refer to Section 01 31 00 – Project Management and Coordination for additional details.

PART 2 - PRODUCTS
A. Not Applicable

PART 3 - EXECUTION
A. Not Applicable

END OF SECTION 26 00 00
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. Medium voltage distribution equipment, cable and devices (13.2 kv and above)
2. Low-Voltage Transformers
3. Switchboards
4. Panel boards
5. Motor Control Centers
6. Enclosed Switches and Circuit Breakers
7. Network Lighting Controls
8. Automatic Transfer Switches
9. UPS Equipment
10. Contactors
11. Wiring Devices
12. Interior and Exterior Lighting
13. Hangers and Supports for Electrical Systems
14. Grounding and Bonding
15. Multi-Outlet Assemblies
16. Generators
17. Modular Wiring Systems
18. Electrical Systems Control
19. Fire Detection and Alarm
20. Communication Systems
21. Lightning Protection System
22. Electronic Meters

C. Submittals shall also include ¼” scale layouts of all electrical rooms, telecom rooms, fire alarm rooms and generator rooms. Include all equipment sizes and clearances.

D. 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. The University/Anschutz Medical Campus Project Guidelines and Standards.
8. International Building Code in accordance with the Campus Building Official.
9. ASTM - American Society of Testing Materials
10. IPCEA - Insulated Power Cable Engineers Association
11. Underwriter's Laboratories (UL)
12. American National Standards Institute (ANSI)
13. 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:

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   Time-rated floor or wall assemblies.
   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. Install access panel or doors where equipment or boxes are concealed behind finished surfaces in areas such as restrooms. These access doors shall be a minimum of twenty by twenty inches or as required to accommodate full pull box or equipment access.

N. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
O. 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.

P. Consult all other drawings. Verify all scales and report any dimensional discrepancies or other conflicts to Engineer before submitting bid.

Q. 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.

R. Furnish and install all necessary hardware, hangers, blocking, brackets, bracing, runners, etc. required for equipment specified under this Division.

S. Remove all unused or abandoned conduit, junction boxes, panels, and other electrical components back to the source.

T. Provide GFCI type receptacles for all "above counter" receptacles located within 6' of any sink or basin.

U. Provide GFCI type receptacles for receptacles located with 6' of any eyewash station.

V. Clean all luminaries, lamps and lenses prior to final acceptance. Replace all inoperative lamps.

W. Provide all power feeds and final connections to motors and other electric equipment furnished under Divisions 21, 22, and 23.
   1. Install and wire through all control devices which directly handle full load motor or electric heating equipment current, such as magnetic starters, line voltage thermostats, P.E. switches, etc. which are furnished by Electrical Contractor. Located where shown on the electrical drawings.
   2. Provide disconnects for all mechanical equipment as indicated on project drawings.
   3. Provide all power and control wiring which directly handles full load current of motors or electric heating equipment.

3.2 TESTING, CLEANING AND CERTIFICATION

A. Operating and Acceptance Tests: Provide all labor, instruments, and equipment for the performance of tests as specified below and elsewhere in these specifications.
   1. Perform a careful inspection of the main switchboard bus structure and cable connections to verify that all connections are mechanically and electrically tight.
   2. For a one-day period after the remodeled area has been placed into normal service, record the full load current in each phase or each line at the panel bus and submit to the Engineer.

B. Test Reports:
   1. Test Reports: Submit three (3) copies of test results.
   2. The final University inspection of the project will not be made until a satisfactory report is received and approved by the University Project Manager.
   3. Results shall include:
      a. Insulation resistance readings for each segment of high voltage (over 600V) cable, each phase.
      b. Insulation resistance readings for transformers for each phase of primary and secondary to ground and for primary to secondary.
      c. Insulation resistance readings on all feeders entering main distribution switchboard, each phase.
      d. Resistance to ground readings for main distribution switchboard service ground.
      e. Insulation resistance readings for all motors and motor feeders 5 horsepower or greater.
      f. Full load current reading for main service entrance and main distribution panel board, each phase.
4. Testing shall be done by an independent testing agency.

C. 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 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 DESIGN REQUIREMENTS

A. Provide complete wire and cable system to meet the requirements of the project. Provide wire sizes in accordance with NEC.

1.2 SUBMITTALS

A. Product data shall be submitted for in accordance with the requirements of Section 260500 each of the following:
   1. Wires
   2. Cables
   3. Connectors

1.3 QUALITY ASSURANCE

A. Wire and cable shall be provided and installed in accordance with the requirements of Section 260500.

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.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Wire and cable shall be delivered, stored and handled in accordance with the requirements of Section 260500.

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.

1.5 WARRANTY

A. Wire and cable warranties shall be provided in accordance with the requirements of Section 260500.

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 insulated wire.
   7. Type NM, NMC, NMS cable are not acceptable for any application.
   8. Use copper wire only.
   9. No wire splices shall be allowed in the conduit or conduit fittings. All splices shall be done in an approved box.
10. Grounding conductors shall be copper type THHN with green integrally-colored insulation, sized to meet NEC.
11. 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 to fluorescent light fixtures, 12-gauge minimum.
   2. Type THHN 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. BAS Conductor installation: (see Section 23 09 13)

D. Wires and Cables:
1. On systems greater than 600V thoroughly swab raceway before installing wire. Pull conductors simultaneously where more than one is being installed in same raceway. Use pulling compound or lubricant on all cable installations. compound used shall not deteriorate conductor or insulation.
2. 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.
3. 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 solder less connectors NEMA/UL approved for the use. Splice only in accessible junction boxes. Use splices and tap connectors which are compatible with conductor material.
4. Install splices and tapes, which possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
5. 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.
6. Support cables above accessible ceilings, do not rest on ceiling tiles. Use spring clips and hanger rods, bridle rings or 'J' hooks, independent from the ceiling suspension system to support cables from structure.
7. 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.
8. 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.
9. Use split bolt connectors for copper wire splices and taps, 6 AWG through 1 AWG. Tape uninsulated conductors and connectors with electrical tape to 150% of the insulation value of conductor. Rubber, friction and 3M-33 or 88 or better. Two (2) layers minimum each.
10. Use copper compression connectors for copper wire splices and taps, 1/O AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150% of the insulation value of the conductor. Rubber, friction and 3M-33 or 88.
11. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
12. Thoroughly tape the ends of spare conductors in boxes and cabinets.
13. Install exposed cable, parallel and perpendicular to surfaces, or exposed structural member, and follow surface contours, where possible.
14. 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.
15. Parallel conductors shall be cut to the same length and be the same type of wire.
16. All splices in control panels, terminal junction boxes, low voltage control circuits and fire alarm conductors shall be on numbered terminal strip.
17. When routed in a wall, install all thermostat wire, fire alarm, computer cable, low voltage cable, and other communication cable in conduit.
18. All junction boxes shall be fully accessible.
19. 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 COMMISSIONING (DEMONSTRATION)

3.5 SCHEDULES

A. Color code secondary service, feeder, and branch circuit conductors as follows:

<table>
<thead>
<tr>
<th>120/208 Volts</th>
<th>Phase</th>
<th>277/480 Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>A</td>
<td>Brown</td>
</tr>
<tr>
<td>Red</td>
<td>B</td>
<td>Orange</td>
</tr>
<tr>
<td>Blue</td>
<td>C</td>
<td>Yellow</td>
</tr>
<tr>
<td>White</td>
<td>Neutral</td>
<td>Gray</td>
</tr>
<tr>
<td>Green</td>
<td>Ground</td>
<td>Green</td>
</tr>
<tr>
<td>Switch leg - Pink</td>
<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

1.1 DESIGN REQUIREMENTS

A. Ground the electrical service system neutral at service entrance equipment to grounding electrode system: cold water service pipe, building steel, concrete encased electrode and supplementary grounding electrodes in compliance with NEC.

B. Ground each separately derived system neutral to nearest metallic cold water pipe, 2" diameter or larger, building steel or the referenced ground bar as shown on drawings.

C. Provide grounding for telecommunications systems in accordance with the requirements in Section 27 05 26 Ground and Bonding for Communications Systems. Minimum conductor size between ground bar 3/0.

D. Interconnect all ground bars in the building.

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. Grounding and Bonding for Communications Systems. Provide code-sized ground cable bonding jumpers, installed with ground clamps, across all conduit expansion couplings and fittings.

D. 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.

E. All continuous runs of cable tray and all isolated sections of cable tray shall be grounded at intervals not to exceed 20 feet.

F. Provide an equipment-grounding conductor in all nonmetallic and flexible conduits.

G. Provide equipment-grounding conductor in all branch circuits. Route to switches, receptacles, equipment enclosures, equipment, and panels etc. and ground as required.

H. Use mechanical grounding connectors for all grounding connections. Exothermic welded connections may be used underground or to building steel.

I. Minimum ground resistance:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Earth Ground Resistance to Equipment (Ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pad Mount Transformer</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Secondary neutrals and other ground</td>
<td>10</td>
</tr>
<tr>
<td>Lightning protection grounds</td>
<td>5</td>
</tr>
</tbody>
</table>

J. Provide a separate insulated equipment-grounding conductor in feeder and branch circuits. Terminate each end on a grounding lug, buss or bushing.

K. Provide grounding bushings and bonding jumpers for all conduits terminating in reducing washers, concentric, eccentric or oversized knockouts at panel boards, cabinets, and gutters.

L. 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. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for no armored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.

G. 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.

H. 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.

I. 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.

J. J-Hooks and Bridle Rings
   1. J-hooks and bridle rings maybe used to support low voltage wiring systems.

K. 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. In open overhead spaces, support metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an engineer approved type of fastener not more than 24 inches from the box.

F. 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.

G. 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.

H. Telecommunications Systems Cable Supports: Use cable tray or telecommunications approved cable supports.

END OF SECTION 26 05 29
SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SYSTEM DESIGN REQUIREMENTS

A. Provide complete raceway system required to meet project requirements in sizes as required by NEC.

B. Utilize boxes as part of the electrical raceway system. Size boxes in accordance with NEC requirements and this standard.

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

4. Wire ways:
   a. Hinged cover or screw cover complete with all necessary fittings which shall be of one manufacturer.

2.2 MATERIALS, GENERAL

A. Metal Conduit and Tubing:

1. Galvanized Steel Rigid Conduit (GRC):
   a. Conduit: Provide rigid steel conduit, hot-dipped galvanized with threaded ends Fittings: Threaded galvanized steel, bushings shall have nylon-insulated throat.

2. 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.

3. Intermediate metal conduit (IMC)
   a. Conduit: Provide intermediate steel conduit hot-dipped galvanized Fittings: Threaded galvanized steel, bushings shall have nylon-insulated throat.

4. Rigid Aluminum Conduit:
   a. Not allowed unless otherwise noted.

5. 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.

6. Liquid-Tight Flexible Metal Conduit:
   a. Conduit: Continuous spiral wound, interlocked zinc-coated steel with polyvinyl chloride (PVC) jacket, NEMA/UL approved for grounding.
   b. Fittings: Cadmium plated malleable iron. Straight and angle connectors shall be the same as used with flexible metal conduit but shall be provided with a compression type steel ferrule and neoprene gasket sealing rings.

7. Non-metallic Rigid Conduit
   a. PVC plastic schedule 40

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” 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. Rigid Galvanized conduit or intermediate metallic steel conduit shall be installed in the following
      areas.
      a. All outdoor non-conditioned locations concealed and exposed.
      b. Interior exposed. Below 10 feet to floor. PVC coated 90 degree elbows underground when
         penetrating floor slabs.
   2. 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.
   3. 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.
   4. 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 27 05 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. Install pull wires in empty raceways. Use #14 AWG zinc-coated steel or monofilament plastic line having not less than 200-pound tensile strength. Leave not less than 12 inches of slack at each end.

14. Telecommunications and Signal Systems Raceways: Refer to Section 26 05 28 Pathways for Communications.

15. Install raceway-sealing fittings in accordance with the manufacturer’s written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL Listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway-sealing fittings at the following points and elsewhere as indicated:
   a. Where conduits enter or leave hazardous locations.
   b. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.
   c. Where required by the NEC.

16. 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.

17. Conduit Seals: Conduit passing through concrete walls shall be sealed.

18. 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.

19. Ream the ends of all cut and/or threaded conduit. Ends shall be cut square.

20. Use of running threads for rigid metallic conduit are not permitted. When threaded couplings cannot be used, provide 3-piece union or solid coupling.

21. Conduits shall not cross pipe shafts or ventilation duct openings “access panel”.

22. 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.

23. Install an insulated ground conductor in all conduits.

24. 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.

25. 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.
26. 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
27. Provide for waterproofing of all raceways, fittings, etc., which penetrate the roof to preserve the
weatherproof integrity of the building. Installation of materials shall conform to the following:
   a. General:
      1) Install all raceways concealed except at surface cabinets, for motor and equipment
         connections and in mechanical equipment rooms. Install a minimum of 6 inch from
         flues, steam pipes or other heated pockets for water-flashing and counter-flashing or
         pitch pockets for waterproofing of all raceways, outlets, fittings, etc., which
         penetrate roof. Route exposed raceways parallel or perpendicular to building lines
         with right angle turns and symmetrical bends. Concealed raceways shall be run in a
         direct line, and where possible, with long sweep bends and offsets.
      2) Provide raceway expansion joints with necessary bonding conductor at building
         expansion joints and where required to compensate for raceway or building thermal
         expansion and contraction. Terminate raceways 1-1/4 inch and larger with insulated
         bushing or rain tight connections with insulated throats.
28. Special areas methods for raceway installation (with appropriate seal-offs, explosion-proof
    fittings, etc.), in all special occupancy areas, as defined and classified in Article 500 of the
    National Electric Code (NEC), shall be in accordance with that Article.
29. 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.
30. All underground raceways, not under the building footprint, shall be installed so it slopes away
    from the building.

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.
   2. Wire ways, where indicated, complete with elbows, tees, connectors, adaptors, etc., with all parts
      factory-fabricated and of same manufacture.

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. Switch Outlet and Panel board height dimensions to meet ADA requirements.

3. Above counters, benches, special equipment, baseboards, fin tube radiators, etc., or at wainscoting, outlets shall be mounted minimum 6 inches above to prevent interferences to service equipment, or as noted on drawings.

4. Fire rated poke-through shall be installed in areas to miss beams and ductwork in ceiling below. Floors shall be X-rayed before core drilling.

5. 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.

6. 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.

7. 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.

8. 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.

9. Ceiling outlets: For fixtures, where wiring is concealed, use outlet boxes 4-inches square by 1-1/2 inches deep, minimum.

10. Protect outlet boxes to prevent entrance of plaster, and/or debris. Thoroughly clean foreign material from boxes before conductors are installed.

11. Concrete boxes: Use extra deep boxes to permit side conduit entrance without interfering with reinforcing, but do not use such boxes with over 6-inch depth.

12. 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.

13. 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 DESIGN REQUIREMENTS

A. All electrical equipment and systems shall be properly labeled in accordance with this section. It includes requirements for electrical identification components including but not limited to the following:
   1. Identification labeling for raceways, cables, and conductors.
   2. Equipment labels and signs.

1.2 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 System Raceways with Color Banding: Band exposed or accessible raceways of the following systems for identification. Bands shall be pre-tensioned, snap-around colored plastic sleeves, colored adhesive marking tape, or a combination of the two. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side. Install bands at changes in direction, at penetrations of walls and floors, and at 40-foot maximum intervals in straight runs. Provide Brady B-946 vinyl or equivalent. Colored duct tape is not acceptable. Apply the following colors:
1. Security System: Blue and Yellow with Gray Cable.
2. Telecommunications System: Green and Yellow with Blue and White Cables.
6. Lighting Control Cabling shall be Green.

E. 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.

F. 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.

G. Install equipment/system circuit/device identification as follows:
1. Apply equipment identification labels of engraved plastic-laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless the unit is specified with its own self-explanatory identification. Text shall match terminology and numbering of the Contract Documents and shop drawings. Identification must include equipment name, voltage, phase, amperage, and fed from. Apply labels for each unit of the following categories of electrical equipment.
   a. Switchboards, switchgear, panelboards and enclosures, 1/2” high lettering.
   b. Access doors and panels for concealed electrical items, 1/4” letters
   c. Transformers 1/2” high letters.

H. 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.

I. 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.

J. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
K. 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 DESIGN REQUIREMENTS

   A. Provide distributed network lighting control system. Define the lighting control zones to individual rooms, areas or individual fixtures as coordinated with the university Facilities Group.

   B. Interface lighting control zones with the Building Automation System (BAS) control zones. Provide all hardware, cabling and devices as needed for required hardwired interface.

   C. Provide minimum 25% spare capacity including equipment ratings, housing capacities, spare relays, terminals and controls.

   D. Provide a graphic user interface with a graphic display for programming lighting control zones.

   E. Complete coordination drawings for occupancy zones to interface with mechanical zones for HVAC operation.

   F. Coordinate the location of the components on the shop drawings using the reflected ceiling plans. Do not mount devices over fixtures, diffusers, or sprinkler heads. Do not mount occupancy sensors in ceiling tiles with sprinkler heads.

   G. Network Backbone devices to be install on UPS system, if UPS is unavailable install on generator power.

   H. All areas with A/V equipment shall have coordination with controls to initiate shutdown sequence when area goes unoccupied.

1.2 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.

1.3 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
   1. See table Naming-Encelium for Encelium Devices
   2. See table Naming-nLight for nLight Devices
   3. Submit naming convention for any devices not cover in Encelium or nLight 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).

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 lighting 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
   4. Provide sensor with minimum timeout of 30 seconds.
   5. Sensor timeouts shall be configurable by System software. Above the minimum sensor timeout setting.
   6. Mounting: Sensors for mounting on ceilings and walls, including corners, must be available.
   7. 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.
   Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal
   voltage or below.
2. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates
   unit operability.
3. LED Indicator Light: Indicates status of normal and emergency power.
4. All emergency lighting shall be ‘on’ upon activation of the fire alarm system.
5. Emergency lighting shall be controlled with a shunt to keep off based upon occupancy and emergency
   operation.
6. 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 OPEN OFFICE
A. Provide occupancy sensor control in all open office areas. Configure open office with auto on/off.
   Provide manual dimming controls.
B. Provide daylight harvesting controls for all fixtures adjacent to exterior windows or skylights. Dim to
   minimum 10% before switching fixture(s) when adequate daylight is detected by photocell.
C. Provide hardwired I/O module interface with BAS controls.

3.3 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.

3.4 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.

3.5 SPECIALTY AREAS

A. Coordinate lighting control requirements with the university project manager for all specialty areas such as but not limited to laboratories, conference centers, animal facilities and clinical facilities.

B. Provide hardwired I/O module interface with BAS controls.

3.6 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.

3.7 PARKING GARAGE

A. Provide photocell control of perimeter fixtures for daylight harvesting controls. Switch fixtures off when adequate daylight is present.

B. Control light fixtures at drive entry locations such that higher light levels are provided during daytime hours and lower light levels at night.

3.8 ANIMAL CARE FACILITIES

A. Provide a separate lighting control system from the building control with graphic screens. Provide full manual override capabilities from the lighting control computer.

B. Provide automatic controls with a 12-hour On/Off cycle at the half light level of 30 foot-candle in each holding room. Review with the University Project Manager.


D. Provide red filter over a single lamp, verify spectrum with the university. Provide manual “On” switch inside each holding room with a 15-minute delay.

E. Provide all holding rooms with positive verification back to lighting control computer.

3.9 LECTURE HALL/AUDITORIUM

A. Provide dedicated dimming control system with multi-zone capabilities. Provide dimming to minimum 1%.
B. Coordinate zones with audio/video system to allow for video and projection presentations, video conferencing, etc. Provide light fixtures closest to the projection screen or monitor on a separate lighting zone from the rest of the room.

C. Provide low voltage control to all motorized shades and project screens.

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:
   1. All communication wiring shall have the exact route shown on a floor plan.
   2. Include the working construction drawings set from the installation sub-contractor.
   3. Exact locations of all devices including panels, communication devices, IO devices, etc. shall be shown. Any room numbers changes during construction will be incorporated into the record documentation.
   4. All changes made during installation shall be shown, update the devices to where they are actually installed.
   5. The electrical circuits used by the network lighting should be clearly indicated as panel and circuit number.
   6. Unit communication address identifiers shall be shown.
   7. Conductor and network identifier numbers shall be shown.
   8. Update the bill of material to show the installed device quantities.
   9. The electric circuiting layer needs to be turned on for the drawing.
   10. Update drawings and remove any notes, clouds, x’s and removed devices.
   11. Include the X-ref(s) to the AutoCAD drawings.
   12. Update the Title Block on the drawings.

C. 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.

D. 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 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.
### Encelium lighting controls naming conventions

<table>
<thead>
<tr>
<th>Module Type</th>
<th>Building</th>
<th>Room</th>
<th>Device Name Line</th>
<th>Device Designator</th>
<th>Device Description</th>
<th>Notes</th>
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<td>Modules for Sensors</td>
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<tr>
<td>1400</td>
<td>GGY-1</td>
<td>nGYN1GYN</td>
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<td>Reflects the physical location of gateway.</td>
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<td>nMS1MS</td>
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### Occupancy Sensors

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### Daylighting Sensors

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<td>GS-1</td>
<td>nGWY1GWY</td>
<td>nLight Gateway (Series 1) Clock &amp; Network Interface Controller</td>
<td>Reflects the physical location of gateway.</td>
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<tr>
<td>1400</td>
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<td>nGWY2GWY</td>
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<tr>
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<td>nLS1LS</td>
<td>nLight Bridge 1-Port</td>
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### Relay Packs for Wall

<table>
<thead>
<tr>
<th>Building</th>
<th>Device</th>
<th>Device Name</th>
<th>Device Description</th>
<th>Notes</th>
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<tbody>
<tr>
<td>1400</td>
<td>GRY-1</td>
<td>nGYN1GYN</td>
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### Relay Packs for Fixture Control

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### Ethernet Switches

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<tr>
<td>1400</td>
<td>PNL</td>
<td>1-999</td>
<td>777-1400-PNL1-a</td>
<td>nPSNL1.2 480 Cabinet w/ 2 Relays (208/277/480 VAC) &amp; 2 Dimming Outputs (0-10 VDC)</td>
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<tr>
<td>Rooms 1401 through 1420</td>
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</tr>
</tbody>
</table>

END OF SECTION 26 09 43
SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 DESIGN REQUIREMENTS

A. Plug-in type devices are not acceptable.

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.
   3. Fire Rated Poke-through Receptacle: Hubbell systems or approved equal.
   4. Multi-Outlet Assembly (MOA): Hubbell or Wiremold.

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.
   4. Standby Receptacles: Single or duplex minimum 20-amp, color red.
   5. Isolated Ground Circuit: Single or duplex minimum 20-amp, color orange, with isolated ground.
   7. Telephone or CRT Receptacles: 4 inch square box with one gang plaster ring and 5/8 inch diameter grommet hole split plate.
   8. Special Purpose Receptacles: Provide where shown on drawings. Standard grade, standard color, and of the appropriate code and NEMA configuration to match the supply circuit and load involved. Provide proper grounding through receptacle for equipment.
   9. Fire Rated Poke-through: Provide where shown on drawings. Poke-through shall provide services as shown on drawings and have a carpet saver feature.

<table>
<thead>
<tr>
<th>Type</th>
<th>Amps</th>
<th>Volts</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duplex</td>
<td>20</td>
<td>125</td>
<td>HBL5362</td>
</tr>
<tr>
<td>Duplex – Isolated Ground Fault</td>
<td>20</td>
<td>125</td>
<td>GFR5362</td>
</tr>
<tr>
<td>Duplex – Isolated Ground</td>
<td>20</td>
<td>125</td>
<td>IG5362</td>
</tr>
<tr>
<td>Single</td>
<td>20</td>
<td>125</td>
<td>HBL5361</td>
</tr>
<tr>
<td>Single</td>
<td>30</td>
<td>125</td>
<td>HBL9308</td>
</tr>
</tbody>
</table>
### 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. **Handle**: Red for emergency power circuits. Verify color for normal power devices with Engineer prior to ordering.
3. **Pilot Light Type**: Lighted handle lit when switch is "on."
4. **Locator Type**: Continuously lighted handle.

<table>
<thead>
<tr>
<th>Switch Type</th>
<th>Model</th>
<th>Amps</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Pole Switches</td>
<td>#1221</td>
<td>20</td>
<td>277 volts</td>
</tr>
<tr>
<td>Three-Way Switches</td>
<td>#1223</td>
<td>20</td>
<td>277 volts</td>
</tr>
<tr>
<td>Four-Way Switches</td>
<td>#1224</td>
<td>20</td>
<td>277 volts</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 DESIGN REQUIREMENTS

A. General Information:
   1. Lighting design shall take into consideration for fixture and remote driver maintenance and replacement. Fixtures shall be accessible from a standard ladder located on a level floor or landing.
   2. Lighting Requirements:
      a. General:
         1) Provide energy efficient LED luminaries wherever possible.
         2) Color temperature shall be 4000K unless requested otherwise. Minimum CRI shall be 80.
         3) Luminary installations must comply with requirements set forth in other sections of this Division 26.
         4) Provide emergency and exit lighting per NFPA, IBC and NEC requirements and recommendations. Exit lights should be LED type.
         5) If emergency generator circuits are not available, provide emergency lighting battery packs in elevator machine rooms, mechanical rooms electrical rooms. Fire, Security rooms and Egress Lighting per Fire Code.
         6) Refer to current edition of the IES for lighting levels in areas not included in the following paragraphs.
         7) LED drivers shall be low inrush current type.
         8) Provide LED luminaries with 0-10V flicker-free dimming to 10%, power factor >0.90, less than 20% THD.
         9) Provide Energy Star or DLC listed LED fixtures.
         10) Minimum foot-candle level in corridors shall be 20 foot candles.
         11) Minimum foot-candle level in lobbies shall be 15 foot-candles.
         12) The university standard corridor lighting consists of 2’x4’ recessed luminary consistent with current LEED design.
      b. Offices:
         1) Minimum foot-candle level shall be 30 foot-candles. Offices that require detail work at their desk shall be provided with minimum of 50 foot-candles. Rooms with special VDT requirements may be provided with less than 30 foot-candles, personal dimming control shall be provided.
         2) The university standard office lighting consists of 2’x4’ recessed luminary
      c. Laboratories:
         1) Minimum foot-candle level shall be 75 or current NIH Standards whichever is higher. This light level shall be achieved without the use of task lights.
      d. Classrooms:
         1) Minimum foot-candle level shall be 40.
         2) Computer classrooms shall be provided with pendant-mounted indirect luminaries. Luminaries shall be mounted with aircraft cable. Maximum length of steel indirect product shall be 12'-0”. Minimum foot-candle level shall be 25.
         3) Laboratory classrooms: Minimum foot-candle level shall be 75.
         4) Coordinate fixture type with ceiling projectors as needed. Fixture location shall not obstruct projector.
         5) Lighting shall be LED with 0-10V flicker free dimming to 1%.
      e. Equipment Rooms:
         1) Provide a minimum of 3 foot-candles on vertical surfaces and 30 footcandles at 30” high horizontal surfaces.
      f. Lecture Halls/Auditoriums:
         1) Lighting shall be LED with 0-10V flicker free dimming to 1%.
2) Lighting zones and control locations shall be coordinated with the university prior to final construction drawings.

3) Lighting design shall take into consideration for fixture maintenance and replacement. Review fixture accessibility with the University Project Manager prior to Design Completion.

g. Exit/Egress Lighting:
   1) Provide adequate exit/egress lighting per code requirements.
   2) Coordinate with the university project manager if the egress fixtures are to be controlled with the normal adjacent fixture or if they are to be used as night lights.

h. Dark Rooms:
   1) Provide local manual controls for dark room light fixtures.

i. Outdoor Lighting
   1) Outdoor lighting should be zoned to provide flexibility for safety and economy.

j. Animal Facilities
   1) Provide dual level lighting in all holding rooms. Provide 30 foot-candles at half level and 60-70 foot-candles at full “On”.
   2) Provide red filter on one lamp controlled separately in all holding rooms which eliminates wave lengths visible to animals, verify with the university.
   3) Provide surface mounted, lensed “wash down” and gasketed fixtures throughout the facility.

k. Janitor Closets
   1) Provide Lensed LED strip light fixture.

1.2 SUBMITTALS

1.3 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 MANUFACTURES

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. LED Fixtures:
      a. Lithonia Lighting
      b. Gotham Lighting
      c. Peerless Lighting
      d. CREE Lighting
      e. Philips Lighting

2.2 MATERIALS, GENERAL

A. Provide low-energy LED drivers capable of operating with high power factor >0.90, rapid-start, and low-noise features; Type 1, Class P; sound-rated A. Total Harmonic Distortion shall be less than 20%.
B. 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.

C. Provide LED drivers with low in-rush current.

D. Exit Signs: Housing shall be extruded aluminum. Face shall be translucent white with green lettering. Directional arrows shall be universal for field adjustment. Mounting shall be as indicated on project drawings. Battery shall be provided if an emergency source is not available. Lamp shall be LED type. Input voltage shall be as shown on drawings. H-3 radioactive exit signs must not be specified.

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. Provide plaster frames for recessed luminaries installed in other than suspended grid-type acoustical ceiling systems. Brace frames temporarily to prevent distortion during handling.

E. 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.

F. 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).

G. Provide additional supports for all surface-mounted luminaries greater than 2 feet in length in addition to the outlet box.

H. Overall dimensions of incandescent or fluorescent fixtures recessed in suspended grid ceilings shall be such that they will fit into grid ceiling with no distortion or field repair to fixtures and with no distortion of ceiling grids. If field repair is required, the engineer shall be notified immediately. All fixtures must be supported independent of the ceiling grid per NEC. Coordinate installation of the fixtures with installer of ceiling so that ceiling will be absolutely level after completion.
I. 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.

J. 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 REFERENCES

A. General provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections.

B. Architectural, Electrical, and Technology Drawings. Other systems drawings may apply. Division 26 Basic Electrical Materials and Methods sections apply to work of this section.

1.2 SUMMARY

A. This section describes the codes, standards, specifications, recommendations, and practices required for construction at The University of Colorado Denver | Anschutz Medical Campus for the Information Technology (IT) Services department. Section 27 00 00 applies to all telecommunications projects at The University.

B. The project general contractor (GC) is responsible for building telecommunications pathways and spaces as per the requirements described in this document. The project GC shall provide these specific items: spaces (telecommunications rooms, telecommunications entrance faculty, and equipment rooms), pathways (riser and horizontal distribution), grounding system, and fire suppression systems, as described below. The IT Services department is responsible, through its contractor, for providing cabling, data networking, and voice equipment.

Planning.
1. To facilitate provisioning of telecommunications services, the architect/engineer shall provide the University IT Services with floor plan drawings for new building construction and major renovation projects during design and at construction. CAD drawings of the Electrical/Communications plans shall be provided to IT Services upon release of construction document through the The University project manager.

2. The project’s technology consultant shall meet with the building’s projected occupants, IT Services Network Services, and IT Services Telecommunications, and other interested parties to determine the telecommunications requirements of the occupants. Compliance with overall campus telecommunications plans will also be validated during these meetings. The technology consultant shall submit all findings to IT Services for review and approval.

3. The preliminary plans, indicating service locations and space requirements, will be returned to project managers for inclusion in the final plans.

Consult with The University IT Services for the following.
1. Acceptability for specific substitutions of specified products.
2. Guidance in the application of a standard or specification in a non-listed or design situation.
3. Approval for deviation from standards and specifications or industry-standard methods and procedures if indicated by special circumstances.

E. Workmanship. All materials and equipment shall be installed in accordance with recommendations of the manufacturer as approved by the architect, to conform to initial design requirements or specification’s and contract documents.

1.3 SUBMITTALS

A. Refer to Section 27 05 00 for requirements.
1.4 QUALITY ASSURANCE

A. Applicable Codes, Standards, and Specifications: The following list of codes, standards, specifications, recommendations, and methods and procedures (M&P) are applicable to the provisioning of telecommunications services for The University. They are incorporated by reference.

2. ANSI/EIA/TIA-568-C.0: Generic Communications Cabling for Customer Premises.
11. ASTM: American Society for Testing and Materials
18. ICEA: Insulated Cable Engineers Association
19. IEEE-802.11 a, b, g, n: Wireless Local Area Networks
20. IEEE-802.3: 10Mb/s, 100Mb/s, 1Gb/s, and 10Gb/s Ethernet Standards as applicable based on media types (twisted pair copper, fiber optics, etc.)
21. IEEE-802.3ak: 10Gb/s Ethernet (evolving copper standard).
22. IEEE-802.3af: Power-over-Ethernet (PoE).
24. IEEE-141: Recommended Practice
27. NESC: National Electrical Safety Code
28. NEMA Stds Pub No. VE 1, Cable Tray Systems. Additionally, comply with current edition of NEC, as applicable to construction and installation of cable tray systems.
29. NEMA Std 250: Enclosures for Electrical Equipment (1000 Volts Maximum).
32. UL Compliance: Provide products which are UL-listed and labeled.

B. Requests for variations from code shall be submitted to the University Code Official via the University project manager and must have IT Services approval. The University Code Official will either disapprove or approve the request. In general, requests for code variations shall not be looked upon favorably. Variations from standards may be authorized by the University IT Services on a case-by-case basis and must be requested in writing by the designer through the University project manager.
C. The University owns and maintains its telephone and communications distribution system. The University IT Services will provide design parameters for the distribution systems and for systems in individual buildings, and IT Services shall be consulted during project design through the assigned University project manager.

1.5 DEFINITIONS

A. Telecommunications. Any transmission, emission, or reception of signs, signals, writings, images, and sounds, or information of any nature by wire, radio, visual, or other electromagnetic systems. Includes, but is not limited to, voice communications networks, Local Area Networks (LAN), Wide Area Networks (WAN), and Local Exchange Carriers (LEC).

B. Telecommunications Room (TR). A floor serving facility for housing telecommunications equipment, cable terminations, cross-connections, and network electronics. The TR is the recognized transition point between the building backbone and the horizontal pathway facilities.

C. Equipment Room (ER). A campus serving space. An ER houses primary system electronics, power, and media distribution for a campus or groups of buildings. The Communications Center in Building 500 is an example of a campus serving ER. ERs require extensive planning due to their size, nature, scope, and complexity. ERs are not typically required for most projects.

D. Telecommunications Entrance Facility (TEF). Serves as the entry point into a building for the campus backbone media. TEFs interconnect the building backbone to campus backbone. The TEF is where conductive copper media receives its primary protection from sustained hazardous voltages. Therefore, significant wall space in the TEF may be required for primary protection of copper circuits. Also called the Service Entrance (SE).

E. Telecommunications Main Grounding Busbar (TMGB). The building’s main telecommunications grounding point. The TMGB is busbar placed in the TEF, ER, or a selected TR to provide interconnection to the building’s power ground via a bonding conductor for telecommunications.

F. Telecommunications Grounding Busbar (TGB). A common point of connection for telecommunications systems and equipment for bonding to ground. TGBs are required in all TRs and ERs.

G. Telecommunications Bonding Backbone (TBB). A conductor that electrically interconnects the TMGB to all TGBs.

H. Grounding Equalizer (GE). A conductor used to interconnect two or more vertical TBBs in multistory buildings. Previously called a Telecommunications Bonding Backbone Interconnecting Bonding Conductor (TBBIBC).

I. Network. Backbone media and electronics for transport of electronic information between campus entities.

J. Horizontal Distribution. The facility used for installation of media from the TR to the work area. Usually consists of cable tray and J-hooks to the work area faceplate.

K. Work Area (WA). A building space where the occupant generally interacts with the telecommunications equipment. WAs are typically defined as 100 ft² of usable space.

L. Building backbone. The pathways between floors for distribution of media. Building backbone was previously called riser cabling.
M. Campus backbone. The pathways and media that provide connectivity between the Communication Center in Building 500 and all other buildings on the Anschutz Medical Campus (AMC). The campus backbone provides connectivity between buildings. The campus backbone represents the outside plant (OSP) infrastructure.

N. The University Information Technology (IT) Services. Department responsible for telecommunications on the University of Colorado at Denver and Health Sciences Center (the University) campuses.

O. Technology Consultant. A firm or member of a firm that has considerable technology design experience and possesses working knowledge and subject matter expertise in telecommunications code (NEC and NESC), industry standards (see TIA/EIA commercial standards in references), and BICSI methods and procedures (Telecommunications Distribution Methods Manual, LAN Design Manual, and Customer-Owned Outside Plant Design Manual).

1. IT Services maintains a list of pre-screened technology consultants that can be obtained from the the University project manager via IT Services.
2. Technology consultants used for the University projects shall be selected from the pre-screened technology consultant list.
3. Technology consultants not listed on the pre-screened technology consultant list must meet with IT Services for certification and possible inclusion on the list. Firms vying for campus technology consultant designation must possess a registered communication distribution designer (RCDD) on staff. The RCDD must be thoroughly familiar with campus standards and methods and procedures and be dedicated to the assigned project. Contact the IT Services Director of Communications (303.724.0440) for possible interview times.

PART 2 - DESIGN REQUIREMENTS

2.1 SPECIFIC DESIGN SPECIFICATION AND CONSTRUCTION REQUIREMENTS

A. Telecommunications Entrance Facility (TEF) or Service Entrance (SE).

1. All buildings require a TEF. The TEF serves as the entry point into a building for the campus backbone media. TEFs interconnect the building backbone to the campus backbone. The TEF shall be solely dedicated to telecommunications services. Space shall not be shared with electrical installations other than those designed and intended for telecommunications. The TEF shall be vertically aligned or stacked with the TRs to facilitate interconnection with the floors above and below. The University IT Services must be consulted if the TEF does not align with the building’s TRs.

2. TEFs may be co-located inside TRs or ERs, depending on the size of the building they support. Buildings larger than 100,000 ft² may require a dedicated TEF. Buildings with 5 or more stories shall have a shared TR/TEF that is 10’ x 16’. That is, TRs serving as the TEF shall be a minimum of 10’ x 16’. These larger TEFs shall support 5 equipment racks, with one rack being dedicated to fiber optics cable management. TEF ceiling height shall be a minimum of 8’ 6”.

3. The TEF shall be dry and free from the danger of flooding. The TEF shall not be located where water ingress is possible or probable. No water or drain piping shall be routed through the TEF that is not associated with TEF equipment. Steam, heat, and any other source of environmental hazard shall be avoided.

4. TEF location should be carefully considered. Accessibility for the delivery of equipment as well as expansion should be provided for. TR location must also be designed for maximum cable lengths as specified in associated documents listed in References.

5. The TEF location should not be adjacent to any source of electromagnetic interference (EMI). The TEF shall be located away from sources of EMI at a distance which will reduce the interference to 3.0 V/m throughout the deployed frequency range. Interference may not exceed 3.0 V/m throughout the usable bandwidth of the communications cabling. Bandwidth for telecommunications is up to 350 MHz.
6. Typical equipment requirements have a temperature range from 64°F to 75°F (18°C to 24°C) with a desired non-condensing, relative humidity range from 30% to 55%. Humidifiers are not typically required in TEFs. Consult IT Services for TEF cooling requirements.

7. The TEF is where conductive copper media receives its primary protection from sustained hazardous currents. Therefore, significant wall space in the TEF may be required for primary protection of copper circuits. All four TEF walls shall be covered by 3/4" non-combustible A/C plywood mounted 6" above the finished floor (AFF) to 8'6" AFF. (To see a sample of A/C fire rated plywood, contact Strait Lumber 11150 E. Colfax Avenue, Aurora CO or equivalent lumber supplier 303.366.3561; description: 4x8-23/32" AC Fire Retard Ply PLY34ACNC). The A-side (smooth side) of the sheet shall be outward facing. The A/C plywood shall be securely fastened to the wall.

8. TEF design must conform to vibration requirements specified in TIA/EIA−569.

9. The TEF lighting shall be a minimum of 500-lux (50 foot-candles) measured 1 meter from the finished floor and shall be mounted to meet the design configurations of the room. Emergency lighting is recommended.

10. The TEF door shall be a minimum of 36" wide and 80" high, without doorsill, hinged to open outward, unless restricted by building code, and fitted with a lock compliant with IT Services and Facilities assigned key codes.

11. Floors, walls, and ceiling shall be treated and sealed to eliminate dust. Finish shall be light in color to enhance room lighting. Antistatic flooring materials shall be used.

12. All TEF ceilings shall be a minimum of 8' 6" high, unobstructed; to provide space over the equipment frames for suspended cable trays or ladder racks. Suspended cable trays and ladder racks are typically installed at 7’ AFF. TEFs shall be free of false or suspended ceilings. Ceiling protrusions (i.e. fire suppression sprinkler heads) must be placed to assure a minimum of 8 feet of clearance from the finished floor.

13. A dedicated electrical panel shall be placed in each TEF to support telecommunications equipment. The panel shall be rated at 100 Amps or higher to facilitate future growth. The panel may not be shared, it is for the exclusive use of the TEF’s equipment. Emergency generator power is required for the TEF, if available in the project. Label the panel per campus standard.

14. A minimum of three (3) dedicated, unswitched 20A, 120-VAC duplex outlets, each on a separate circuit, shall be provided for equipment power at heights and locations specified by IT Services during the design phase. These three dedicated circuits shall be installed from above into the equipment racks as directed by IT Services. Additional convenience duplex outlets, on a separate dedicated unswitched circuit, should be provided at 6’ intervals around the room. Install the convenience receptacles 15’ AFF or as directed by IT Services. Label all outlets to the campus standard. Emergency generator power is required for the TEF, if available in the project.

15. Sleeves or slots through walls and floors shall be fitted with approved re-enterable firestopping. Applicable codes, standards, and specifications shall be enforced.

16. Building backbone pathways connecting the TEF to TRs will require a minimum of four Trade Size 4” sleeves/conduits for interconnection, except where cable tray exists. A minimum of two (2) spare conduits must be installed when the TEF is not vertically aligned from floor-to-floor to allow for lower fill ratios.

17. Sprinkler heads shall be provided with wire cages to prevent accidental discharge. Preaction sprinklers are preferred over wet pipe or dry pipe systems. If wet pipe or dry pipe systems are employed, then drainage troughs shall be provided under the sprinkler heads and pipes to prevent leakage onto the TEF equipment. High temperature heads are preferred.

B. Telecommunications Room (TR).

1. A minimum of one TR shall be designated per floor and that TR shall be solely dedicated to telecommunications services. Space shall not be shared with electrical installations other than those designed and intended for telecommunications. TRs shall be vertically stacked to facilitate interconnection with the floors above and below.

2. The TR shall be dry and free from the danger of flooding. The TR shall not be located where water ingress is possible or probable. No water or drain piping shall be routed through the TR that is not associated with TR equipment. Steam, heat, and any other source of environmental hazard shall be avoided.
3. The minimum TR size is 10' x 12'. Ceiling height shall be a minimum of 8’ 6”. Variations in size shall be approved by IT Services on a case-by-case basis and will be dependent upon the floor size and applications to be served.

4. TRs shall be designed to meet floor loading (minimum floor loading of 50 lbf/ft²) as specified in the references section.

5. TR location should not be adjacent to any source of EMI. The TR shall be located away from sources of EMI at a distance which will reduce the interference to 3.0 V/m throughout the deployed frequency range. Interference may not exceed 3.0 V/m throughout the usable bandwidth of the communications cabling. Telecommunications bandwidth is up to 350 MHz.

6. TRs require a temperature range from 64°F to 75°F (18°C to 24°C). The desired non-condensing, relative humidity range is from 30% to 55%. Humidifiers are not typically required in TRs. Temperature sensors shall be configured for alarm reporting and HVAC support units shall be installed on emergency power. A minimum of one air change per hour is required. Each TR supports 4 racks of equipment, with each rack requiring 5,000 BTUs of cooling. Fan coil units are the required cooling source.

7. All four TR walls shall be covered by 3/4" non-combustible A/C plywood mounted 6" AFF to 8’6” AFF. (To see a sample of A/C fire rated plywood, contact Strait Lumber 11150 E. Colfax Avenue, Aurora CO 303.366.3561; description: 4x8-23/32" AC Fire Retard Ply PLY34ACNC). The A-side (smooth side) of the sheet shall be outward facing. The plywood shall be securely fastened to the wall.

8. TR design must conform to vibration requirements specified in TIA/EIA–569.

9. The lighting shall be a minimum of 500-lux (50 foot-candles) measured 1 meter from the finished floor and shall be mounted to meet the design configurations of the room. Emergency lighting is desired.

10. The TR door shall be a minimum of 36” wide and 80” high, without doorsill, hinged to open outward, unless restricted by building code, and fitted with a lock compliant with IT Services and Facilities assigned key codes.

11. Floors, walls, and ceiling shall be treated and sealed to eliminate dust. Finish shall be light in color to enhance room lighting. Antistatic flooring materials shall be used.

12. All TR ceilings shall be a minimum of 8’ 6” high, unobstructed; to provide space over the equipment frames for suspended cable trays or ladder racks. Suspended cable trays and ladder racks are typically installed at 7’ AFF in TRs. TRs shall be free of false or suspended ceilings. Ceiling protrusions (i.e. fire suppression sprinkler heads) must be placed to assure a minimum of 8 feet of clearance from the finished floor.

13. A dedicated electrical panel shall be placed in each TR to support telecommunications equipment. The panel shall be rated at 100 Amps or higher to facilitate future growth. The panel may not be shared, it is for the exclusive use of the TR’s equipment. Emergency generator power is required for all TRs, if available in the project. Label the panel per campus standard.

14. A minimum of two dedicated, unswitched 20A, 120-VAC duplex outlets, each on a separate circuit, shall be provided for equipment power at heights and locations specified by IT Services. These two dedicated circuits shall be installed from above into the equipment racks as directed by IT Services. These two unswitched circuits shall be harnessed from the dedicated panel described above. Additional convenience duplex outlets, on a separate dedicated unswitched circuit, should be provided at 6’ intervals around the room. Install the convenience receptacles 15” AFF or as directed by IT Services. Label all outlets to the campus standard. Emergency generator power is required for each TR, if available in the project.

15. Sleeves or slots through walls and floors shall be fitted with approved re-enterable firestopping. Applicable codes, standards, and specifications shall be enforced.

16. Building backbone pathways connecting TR’s will require a minimum of four (4) Trade Size 4” sleeves/conduits for interconnection, except where cable tray exists. A minimum of two (2) spare conduits must be installed when TR’s are not vertically aligned from floor-to-floor to allow for lower fill ratios.

17. Sprinkler heads shall be provided with wire cages to prevent accidental operation. Preaction sprinklers are preferred over wet pipe or dry pipe systems. If wet pipe or dry pipe systems are employed, then drainage troughs shall be provided under the sprinkler heads and pipes to prevent leakage onto the TR equipment. High temperature heads are preferred.
C. Equipment Room (ER).
1. ERs are not required for most buildings; contact IT Services for need and placement.
2. Generally, each campus requires a minimum of one ER. Buildings may require an ER if they are located at some significant distance from the Communications Center in Building 500. The IT Services department will specify when an ER is required. ERs shall be exclusively dedicated to telecommunications services. ER space must not be shared with electrical services other than those designed and intended for telecommunications. The ER should be centrally located to minimize the size and length of backbone cabling as well as provide easements and pathways for backbone and carrier services required of the room. The room shall not be adjacent to any high-voltage electrical services or water mains. A location should also be selected to allow for movement of large or heavy equipment. Access to cable pathways are required. ER walls should extend to provide a sealed environment for equipment.
3. The ER may also serve as the TEF facility for local exchange carriers (LEC) or competitive local exchange carrier (CLEC) where such a separate facility does not exist. Adjacency to existing carrier entrance facilities is required.
4. Sizing of ER will be calculated using area of service, types of service provided, and projections of growth. IT Services design engineers will provide space requirements based on these factors. The minimum size of an ER is 150 ft². Working clearances of 3 feet must be provided for all scheduled and installed equipment.
5. ERs may require access (raised) flooring to allow for the cable routing from cable vaults to equipment frames and PBX equipment. Cable tray, or equivalent, must be provided for cable management under the raised floor. Finished floor height must be at least 12” from the sub-floor to accommodate the cable management systems. The plenum area may be used for air handling for equipment cooling. All metal parts of the raised floor must be bonded to ground. Floor panels must be covered with high-pressure laminate or a durable, vinyl tile resistant to static electricity.
6. Floor loading capacity shall be sufficient to bear both the distributed and concentrated load of the installed equipment. The ER distributed loading shall be at least 100 lb/ft² and the concentrated loading must be at least 2000 lbf. Distributed floor loading may range as high as 250 lb/ft².
7. ER design must conform to vibration requirements specified in TIA/EIA−569.
8. The ER shall be dry and free from the danger of flooding. The ER must not be located where water ingress is possible or probable. No water or drain piping shall be routed through the ER that is not associated with ER equipment. Steam, heat, and any other source of environmental hazard shall be avoided.
9. The floors, walls, and ceilings shall be treated and sealed to eliminate dust.
10. All four walls in the ER shall be covered by 3/4” non-combustible A/C plywood mounted 6” AFF to 8’6” AFF. (To see a sample of A/C fire rated plywood, contact Strait Lumber 11150 E. Colfax Avenue, Aurora CO 303.366.3561; description: 4x8-23/32” AC Fire Retard Ply PLY34ACNC). The A-side (smooth side) of the sheet shall be outward facing. The A/C plywood shall be securely fastened to the wall.
11. ER location should not be adjacent to any source of EMI. Interference may not exceed 3.0 V/m throughout the usable bandwidth of the communications cabling. Sources of EMI should be kept 3 meters from the ER. Bandwidth for telecommunications is currently 350 MHz.
12. ER doors shall be a minimum of 36” wide by 80” high. Due to the nature of the equipment located in the ER, ERs require at least one oversized door (72” by 90”) to allow large equipment to be moved in or out. Doors should open outward if permitted by building code or be removable. ER doors shall be secured with either electronic access or a lockset specified by the University Facilities.
13. ER ceilings shall be a minimum of 8’6” high, unobstructed; to provide space over the equipment frames for suspended cable trays or racks. ERs shall be free of false or suspended ceilings. Ceiling protrusions (i.e. fire suppression) must be placed to assure a minimum of 8 feet of clearance from the finished floor.
14. ERs require lighting with a uniform intensity of 500 lux (50 foot candles) when measured 1 meter above the finished floor. Indirect lighting is not recommended. Connect lighting fixtures for ERs to separate electrical circuits from those that accommodate the equipment in the room. To avoid blocking or filtering the light, do not place lighting equipment above equipment cabinets,
termination frames, or other freestanding equipment. Use a light colored finish to enhance room lighting. Provide emergency lighting in ERs.

15. Specific circuits for equipment in ERs will be designated during the space planning process and shall be placed according to IT Services approved blueprints. In addition to those circuits, additional electrical outlets are required in all ERs. All such electrical outlets shall be grounded, non-switched, and separately fused. ERs require one 120-VAC, 20-amp duplex receptacle per every 6 linear feet of wall space. Emergency generator power is required for ERs.

16. ERs typically house the building’s TMGB, which is connected to the building’s electrical entrance facility by the bonding conductor for telecommunications. An ER shall be equipped with a copper TMGB that is a minimum of 24” long, 4” wide, and ¼” thick. The TMGB shall be bonded to building structural steel, the entrance facility, and electrical service grounds with a minimum 6 AWG stranded copper. The TMGB shall be drilled and tapped to accept standard NEMA compliant grounding hardware. Equipment grounds shall use a minimum 6 AWG stranded, insulated copper to the TMGB and be attached with standard NEMA compliant grounding hardware. All TGBs will be bonded to the TMGB with TBBs that are a minimum 6 AWG insulated, stranded copper; with consideration given to using a 3/0 AWG conductor. Refer to J-STD-607-A and NEC Article 250.

17. Temperature and moisture shall be controlled in all ERs. Typical equipment requirements are:
   a. Temperature range from 64° F to 75° F (18° C to 24° C);
   b. Relative humidity range from 30% to 55%; humidifiers are required in ERs;
   c. Heat dissipation of 5,000 BTUs per hour per cabinet.
      1) Temperature sensors shall be configured for alarm reporting and HVAC support units shall be installed on emergency power. Consult IT Services for ER cooling requirements.

18. When cable services for any ER exceeds 1800 pairs, provide a separate room (cable vault) for cable splices. This room should be sized according to the requirements of the facility and should be located adjacent to the ER with free pathways to terminating equipment and cross-connect fields.

19. FM-200 fire suppression agent, or equivalent, is the preferred fire suppression agent in ERs. The ER should be free of automatic fire sprinklers, unless specifically required by building code. In such instances, the sprinklers should be a preaction system, not a wet pipe or dry pipe system. Additionally, such sprinkler systems must have troughs to prevent accidental water damage to the equipment.

20. Fire stops (area around sleeves, drilled core floor openings, and cables) shall be sealed or plugged with an 8-to-1 ratio expandable urethane foam with a 1” thick topping of water plug cement or equivalent. All unused sleeves must be plugged and capped with approved firestop.

END OF SECTION 27 00 00
SECTION 27 05 00 - COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 REFERENCES

A. General provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections.

B. Architectural, Electrical, and Technology Drawings. Other systems drawings may apply. Division 26 Basic Electrical Materials and Methods sections apply to work of this section.

1.2 SUMMARY

A. The term “provide” used throughout this specification and drawings shall mean “furnish, install, test, and certify”.

B. Coordinate project schedule, installation schedule, phasing and any other requirements deemed necessary with Construction Manager and/or General Contractor and all necessary trades to ensure successful completion of work.

C. Phasing, temporary distribution/equipment, cut-over and implementation shall be coordinated with the university and the Office of Information Technology (OIT), Construction Manager and/or General Contractor, Architect, and Engineer.

D. Extent of communications raceway infrastructure work is indicated by Division 27 specifications and Technology drawings and schedules and is hereby defined to include, but not by way of limitation, the provisions of:

1. Raceway systems including but not limited to conduits, cable trays, sleeves, surface raceways, telecommunication services entrance, manholes, pull-boxes, junction boxes, back-boxes, etc. as required and specified in Division 27 sections and select Division 26 sections. The Construction Manager and/or General Contractor shall coordinate this with the Sub-Contractor performing work and determine how scope of work is assigned. The purpose of this specification is to establish design intent and general system scope.

2. All communications raceway infrastructure (i.e. pathways and spaces) shall be provided as part of the Base Building Project including:

3. Communication room hardware and component fit-out including cable tray, backboard, and raceways.

4. Grounding and bonding of all metallic hardware components to the nearest telecommunications grounding bus (TGB) bar including but not limited to equipment racks, cabinets, cable trays, ladder rack, conduits, sleeves, metallic ductwork, and frames.

5. Fire stopping as required. Contractor shall provide fire stopping for all low-voltage openings (including empty low voltage raceway) once cable installation is complete. Confirm specific fire stopping scope requirements with General Contractor and/or Construction Manager.

6. Testing of the grounding systems as noted by specification, drawings, and applicable industry standards. Submit written testing results to OIT.

7. Labeling of all communication infrastructure components with mechanically printed labels.

8. Preparation and submission of product data, shop drawings, testing reports, as-built drawings, and cabling documentation as required in this specification.


10. Manufacturer components, channel and solutions warranties.

11. Installation and testing of all system and components.

12. Onsite administrative and user training.

13. Manufacturer training of components.
1.3 SUBMITTALS

A. General Description and Requirements

1. In addition to the requirements noted herein, refer to Division 1 Specification for additional requirements. As a minimum, Contractor shall ensure all requirements listed here are met.

2. Within 45 days after award of contract or as dictated by the construction schedule (whichever period of time is shorter), the Contractor shall submit prefabrication submittals consisting of product data and shop drawings for approval. Partial submittals will not be accepted without prior written approval from the Architect.

3. Review of the Prefabrication Submittals by the Architect is for purposes of tracking the work and contract administration and does not relieve the Contractor of responsibility for any deviation from the Contract Documents, or from providing equipment and/or services required by the Contract Documents which were omitted from the prefabrication submittals.

4. No portion of the project shall commence nor shall any equipment be procured until the prefabrication submittals have been approved in writing by the Architect. All installations shall be in accordance with the Contract Documents.

5. A detailed completion schedule shall be submitted with the prefabrication submittals.

6. Prefabrication submittals shall be accompanied by a letter of transmittal identifying the name of the project, Contractor's name, date submitted for review, and a list of items transmitted.

B. Product Data:

1. Compliance Matrix: Provide full specification compliance matrix as described in the Specification Response section of this specification section.

2. Warranty Information: Provide all warranty information as described in this specification section for review and approval.

3. Component List: Provide complete submittal component list at the beginning of the submittal package. Component list shall identify each component name, manufacturer, and specific product/part number. All part numbers shall clearly indicate special options, color, accessories, etc. Component list and manufacturer cut-sheets shall be compiled to match the order of each Appendix.

4. Cut-Sheets: Submit manufacturer’s cut-sheets on all components listed within this specification and corresponding appendix. All components and parts being used shall be highlighted in color on cut-sheets to distinguish specific product/part numbers, options, colors, accessories, etc.

5. Product Substitutions: This specification is intended to be performance based, thus all products listed in Appendix 1: Equipment Schedule are benchmark products. The Contractor shall include the listed benchmark product lines in the initial bid as the “base” solution, unless noted otherwise. The Contractor may submit (as a proposed “alternate” solution) substitute manufacturers and models that may be more cost effective or readily available. All substitutions shall meet or exceed the minimum functional, physical, and technical specifications. Acceptance of such substitutions is at the discretion of the university, Architect, and Engineer. Additionally, the requirements of Division 1 Specifications shall apply and may supersede requirements noted herein.

C. Prefabrication Shop Drawings:

1. Symbol Legend, Abbreviations, and Description: Provide drawings including descriptions of all abbreviations, symbols, typical mounting heights, project information, etc.

2. One-Line Wiring Diagrams: Include one-line wiring diagrams indicating all backbone and horizontal cabling, copper pair and fiber strand counts, cable quantities, splice enclosures, etc.

3. Site Plan: Provide complete site and exterior plans indicating all site and building facade mounted communication device outlets, equipment, and components proposed to be installed. Additionally, manholes, pull-boxes, and all major raceway routing shall be indicated for conduits 2-inches and larger. Shop drawings shall represent final conduit routing and manhole and/or pull-box placement as coordinated and/or confirmed with Service Provider, Civil Engineer and other trades.

4. Floor Plans: Indicating all communication device outlets, equipment, and components proposed to be installed. Floor plans shall indicate cable routing origin and labeling scheme for each cable and termination position. Additionally, major raceway routing shall be indicated for cable trays and conduits 2-inches and larger, based on final coordination with all other trades. Shop drawings
shall clearly indicate areas with cable tray clearance limitations and/or other cable access limitations for review and approval by the university, Architect, and Engineer.

5. Enlarged Plans: Provide \( \frac{1}{4}'' = 1'-0'' \) enlarged plans of all communication rooms including Telecommunications Entrance Facilities (TEF), Telecommunications Rooms (TR), and Equipment Rooms (ER), indicating the position of equipment cabinets, racks, wiring terminals, patch panels, grounding equipment, cable tray, fiber and copper terminations, and other low voltage systems equipment layout within the rooms. Additionally, shop drawings shall clearly indicate final conduit/riser (core drill and/or block-out) locations and sizes as coordinated and/or confirmed with Structural Engineer and any field conditions that impact proposed location. Shop drawings shall clearly indicate areas where equipment clearances may be limited, for review and approval by the university, Architect, and Engineer.

6. Details: Including method of attachment of racks to the floor and ladder tray systems, method of attachment of wall mounted distribution frames, grounding details indicating grounding method for cabinets, racks, cable tray, cable management, and power details for rack mounted power distribution.

7. Elevations:
   a. Rack elevations indicating patch panels, fiber terminals and enclosures, vertical and horizontal cable managers, rack mounted power strips or distribution units, etc.
   b. Wall elevations of distribution frame with block size, cable routing, cable management, pair counts, method of attachment, etc.

8. Drawing Scale: Shop drawings shall be drawn to scale and completely dimensioned as to clearly show construction detail.

9. Labeling: Provide documentation of all labeling schemes for conduit, back-boxes, cables, outlets, wiring blocks and/or patch panels, device faceplates, etc.

10. Documentation: Provide a minimum of (1) hardcopy set of prints (in addition to electronic copies) for review or as indicated in Division-1 general conditions.

### 1.4 QUALITY ASSURANCE

#### A. Codes and Standards: All materials and installations shall comply with current applicable codes and standards, including but not limited to:
2. ANSI/EIA/TIA-568-C.0: Generic Communications Cabling for Customer Premises.
11. ASTM: American Society for Testing and Materials
18. ICEA: Insulated Cable Engineers Association
19. IEEE-802.11 a, g, n, a/c: Wireless Local Area Networks
20. IEEE-802.3: 10 Mb/s, 100 Mb/s, 1 GB/s, and 10 GB/s Ethernet Standards as applicable based on media types (twisted pair copper, fiber optics, etc.)
21. IEEE-802.3ak: 10 Gb/s Ethernet (evolving copper standard).
22. IEEE-802.3af: Power-over-Ethernet (PoE).
24. IEEE-141: Recommended Practice
27. NESC: National Electrical Safety Code
28. NEMA Stds Pub No. VE 1, Cable Tray Systems. Additionally, comply with current edition of NEC, as applicable to construction and installation of cable tray systems.
29. NEMA Std 250: Enclosures for Electrical Equipment (1000 Volts Maximum).
32. UL Compliance: Provide products which are UL-listed and labeled.

B. Manufacturer and Product Qualifications
1. Provide products from manufacturers regularly engaged in the production of communications infrastructure components, including but not limited to, raceway, horizontal copper cabling, copper and fiber optic backbone cabling, and connecting hardware.
2. Provide products from manufacturers whose products of similar types, capacities, and characteristics have been in satisfactory use in similar type projects for not less than five years.

C. Contractor Qualifications:
1. Firms with at least seven (7) years of successful installation experience with projects utilizing communications, raceway, horizontal copper cabling, copper and fiber optic backbone cabling, and connecting hardware.
2. The company shall have a fully staffed office with technical installations support personnel within the metropolitan area. (Exceptions to this shall be confirmed through approval by the university, Architect, and Engineer.)
3. The Low Voltage Raceway Contractor shall be a certified installer (current and in good standing with proven history) of the selected manufacturer’s raceway systems and shall provide a 25-year warranty on installation and applications.

D. All materials shall be Underwriters Laboratories (UL) or Intertek Testing Services (ETL) Listed unless otherwise indicated.

E. Coordinate with electrical work and other trades to properly interface installation of communications raceway.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment and components in factory-fabricated containers or wrappings, which properly protect equipment from damage.

B. Store equipment and components in original packaging. Store inside in a well-ventilated space protected from weather, moisture, soiling, humidity, and extreme temperatures.

C. Handle equipment and components carefully to prevent damage. Do not install damaged units or components; replace with new.
1.6 SEQUENCING AND SCHEDULING

A. All work shall be reviewed and coordinated with the Construction Manager and/or General Contractor prior to commencing.

B. Communication systems, infrastructure, raceway and equipment are sensitive to environmental conditions including but not limited to temperature, dirt, dust, and water. The contractor shall ensure the storage and installation of all communication components are sequenced and scheduled accordingly to prevent any damage, loss of performance, and warranty void of such systems. All mis-installed components shall be replaced with new parts and re-installed at the Contractor’s expense.

C. Coordinate installation with Structural, Electrical, HVAC, Plumbing, Fire Protection, and other trades to eliminate disruption and/or conflict with other systems.

D. Sequence installation of communications systems and infrastructure with other work to minimize possibility of damage and soiling during remainder of construction.

1.7 PROJECT SITE CONDITIONS

A. Prior to submitting a proposal, the Contractor shall inspect the Contract Documents, and shall become fully informed as to laws, ordinances, and regulations affecting the project. The Contractor shall immediately bring to the university, Architect, and Engineer’s attention, in writing, any existing condition or statute that contradicts, is in conflict with, or negates the Contract Documents. Failure of the Contractor to become fully informed as to all above mentioned items shall in no way relieve the Contractor from any obligations with respect to their proposal.

B. The Technology Drawings depict equipment locations, backboxes, conduit runs, cabling, etc. in a schematic manner. Field conditions and coordination with related trades may warrant relocations of field devices. No additional compensation will be allowed due to these revisions.

1.8 WARRANTY

A. A one (1) year warranty on the work shall be provided by the Contractor. If, within one (1) year after the date of final acceptance of the installation or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents or provided by a manufacturer, any of the work or equipment is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly including all parts and labor after receipt of notice from the university to do so unless the university has previously given the Contractor a written acceptance of such condition. This obligation shall survive termination of the contract. The university shall give such notice promptly after discovery of the condition. Such notice shall be provided by the university representatives, to be identified, either verbally or in writing.

B. Nothing contained in the Contract Documents shall be construed to establish a shorter period of limitation with respect to any other obligation which the Contractor might have under the Contract Documents or any manufacturer's warranty. The establishment of the time period noted above, after the date of final acceptance or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents, relates only to the specific obligation of the Contractor to correct the work or equipment, and has no relationship to the time within which his obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to his obligations other than specifically to correct the work or equipment.

C. The university reserves the right to expand or add to the system during the warranty period using firm(s) other than the Contractor for such expansion without affecting the Contractor's responsibilities, provided
that the expansion is done by a firm which is an authorized dealer or agent for the equipment of system
being expanded.

1.9 SPECIFICATION RESPONSE

A. Pricing

1. Instructions to Bidders
   a. The following is a partial list of instructions. Bidders are responsible to provide a complete
      proposal inclusive of all information requested in the Contract Documents.
   b. Do not assume anything. Clarify your position in writing with your bid concerning any
      areas that may not be clear to you.
   c. Copies of the bid proposal shall be submitted to the university, Architect, and Engineer for
      review and approval.
   d. Bidders shall prepare equipment lists showing each item included in the bid. Equipment
      Lists must include the quantity, model number, manufacturer and price of each item listed
      under the generic description.
   e. Provide a detailed description of any and all voluntary alternates and include cost changes
      in the Voluntary Alternate Bid forms. Bidders should submit voluntary alternates that will
      either provide for a better system or reduce costs without degrading the system. This
      includes alternate manufacturer and product substitution.
   f. In the instance where the Drawings and the Specifications do not directly coincide, or
      coincide individually, the item of better quality, greater quantity and/or higher cost shall be
      included in the base bid.

B. Compliance

1. Bidders shall submit a Statement of Qualifications with their bid proposal that shall include the
   following information:
   a. Company name, address, telephone number and contact person.
   b. Brief company history.
   c. Resumes of key personnel.
   d. Local staffing description (job descriptions and numbers of persons in each position).
   e. Local service capabilities (hours of operation and parts availability).
   f. Technician factory certifications.
   g. Description of local engineering and project management capabilities.
   h. Line sheet listing major suppliers of security equipment.
   i. Annual dollar value of sales, installation and service of each product line carried.
   j. List of references describing three (3) completed projects of similar size and complexity,
      including names and telephone numbers of the contact persons.
   k. List of references describing similar projects completed in the area including names and
      telephone number of the customer's contact person.
   l. List of similar projects currently under construction in the area including names and
      telephone numbers of the customer's contact person.
   m. Licensing information.

2. Provide a specification compliance matrix indicating compliance or deviation for each item in the
   specification. The matrix shall be comprised of a list of all numbered paragraphs that appear in
   this Specification. Indicate compliance of the proposed equipment and/or services by the word
   "Comply" following each paragraph number. Indicate an exception to the requirement by the
   word "Exception" following the applicable paragraph number. Should the proposed equipment
   and/or services not entirely comply with the requirements specified, but ultimately achieve the
   intent, the Bidder shall explain fully the extent, or lack thereof, of compliance for the applicable
   equipment and/or services proposed. Instances where there is no indication of compliance or
   exception shall be considered non-compliant. This matrix is critical for proposal evaluation.
   Failure to submit may result in the disqualification of the bid. Contractor shall submit Compliance
   Matrix with the Bid Proposal AND at the time of Product Data submittal (as indicated previously
   in this specification) so that a complete security system submittal reviewed can be performed.
3. Additionally, as described in this Specification, bidders shall submit the following information with their bid proposal:
   a. Manufacturer’s literature sheets for all standard manufactured items included in the equipment list and as proposed in the Voluntary Alternate Bid form, if applicable.
   b. Workload and capability statements. The statements shall detail projects that will be active during the completion of this project, and the manpower that would be available for this project.
   c. Confidentiality and return statements. The statements shall guarantee that the Contract Documents shall not be copied or distributed physically or verbally. The Contractor shall also assure the university that the Contract Documents shall be returned in their entirety upon request. The successful Contractor will be provided with as many copies as requested.
   d. Copy of manufacturer’s certification certificate.
4. Certain paragraphs of the Specification require the Bidder to provide information (possibly not listed above) in the proposal to demonstrate compliance with a requirement. If the Bidder fails to provide detailed responses to these items, the proposal will be deemed to be non-compliant to the paragraphs stated.
5. Number all pages of the bid submittal.

PART 2 - PRODUCTS

2.1 Refer to the following specification sections for additional requirements:
   A. 26 05 26 – Telecommunications Grounding and Bonding
   B. 27 05 28 – Pathways for Communication Systems

PART 3 - EXECUTION

3.1 GENERAL COMMUNICATIONS RACEWAY
   A. Examine areas and conditions under which communications raceway systems are to be installed. Notify the university, Architect, and Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.
   B. The Contractor shall be knowledgeable of work to be performed by other trades and take necessary steps to integrate and coordinate their work with other trades.
   C. The Contractor shall be responsible for furnishing all materials indicated on the drawings or as specified herein for a complete communications raceway system.
   D. All communications raceway infrastructure shall be installed in an aesthetically pleasing fashion. All surface raceway in new buildings must be approved by the university, Architect, and/or Engineer.
   E. All communications raceway infrastructure shall be installed to allow for easy adds, moves, and other changes in the future.
   F. Construction within communication rooms must be substantially complete before the installation of telecommunications cabling. This includes, but is not limited to, the installation of plywood backboard, cable tray or ladder rack, electrical outlets, light fixtures, sprinklers and ductwork.
   G. Floor to floor distribution shall be provided with concrete floor sleeves or conduits as noted on the drawings, and as required by the Architectural Design.
H. Provide protective cable bushings on all conduits immediately after installation.

I. Use only electrical 45º or 90º conduit elbows with long bend radii as follows:
   1. 6:1 bend radius of the inside conduit diameter for sizes 2” or less.
   2. 10:1 bend radius of the inside conduit diameter for sizes greater than 2”.

J. Do not place more than two 90º sweeps or exceed 100 ft. between pull boxes without providing a pull box.

K. Fire seal all raceway penetrations and openings to maintain fire rating after communications cables are installed.

3.2 LABELING

A. All communications components shall be clearly labeled using labeling devices (i.e. hand written labels are not acceptable) with white label and black text. All labels shall be consistent font type and size (for respective components).

B. The final labeling scheme shall be coordinated with the university, Architect, and Engineer prior to finalizing and initiating any work. A sample scheme shall be submitted for approval.

END OF SECTION 27 05 00
SECTION 27 05 26 - GROUNDING AND BONDING FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 REFERENCES

A. General provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections.

B. Architectural, Electrical, and Technology Drawings. Other systems drawings may apply. Division 26 Basic Electrical Materials and Methods sections apply to work of this section.

1.2 SUMMARY

A. System Performance Requirements.

1. The Telecommunications Entrance Facility (TEF), Telecommunications Room (TR), and Equipment Rooms (ER) require grounding and bonding. The Office of Information Technology (OIT) does not require an isolated grounding system for its voice and data networks. Each building shall have one Telecommunications Main Grounding Busbar (TMGB), which is bonded to the building’s electrical service entrance and is electrically contiguous to the Grounding Electrode Conductor (GEC). The TGMB is usually located in a TEF, ER, or in an OIT specified TR. Each TR shall have at least one Telecommunications Grounding Busbar (TGB), which is connected back to the TMGB via the Telecommunications Bonding Backbone (TBB).

1.3 SUBMITTALS

A. General Description and Requirements.

1. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

B. Product Data: (Need to create Appendix with part numbers for Grounding Spec.)

1. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

C. Prefabrication Shop Drawings:

1. One-Line Wiring Diagrams: Include one-line wiring diagrams for telecommunications grounding and bonding work which indicate layout of ground rods, location of system grounding electrode connections, routing of grounding electrode conductors, and circuits and equipment grounding connections. Additionally submit ground riser diagram for entire project. Show bus bars with transformer ground electrode conductors, etc.

2. Details: Indicating grounding method for cable tray and cabinets and/or racks.

3. Labeling: Provide documentation of all labeling schemes for grounding busbars and grounding conductors.

4. Documentation: Provide a minimum of (1) hardcopy set of prints (in addition to electronic copies) for review or as indicated in Division-1 general conditions.

1.4 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Firms regularly engaged in manufacture of grounding and bonding products, of types, and ratings required, and ancillary grounding materials, including stranded cable, copper braid and bus, grounding electrodes and plate electrodes, and bonding jumpers whose products have been in satisfactory use in similar service for not less than 5 years.
B. Installer’s Qualifications: Firms with at least 5 years of successful installation experience on projects with telecommunications grounding work similar to that required for project.

C. Codes and Standards:
1. Electrical Code Compliance: Comply with applicable local electrical code requirements of the authority having jurisdiction, and the current edition of the NEC as applicable to electrical grounding and bonding, pertaining to systems, circuits, and equipment.
2. UL Compliance: Comply with applicable requirements of UL Standards No.’s 467, Electrical Grounding and Bonding Equipment”, and 869 “Electrical Service Equipment”, pertaining to grounding and bonding of systems, circuits and equipment. In addition, comply with UL Std 486A, “Wire Connectors and soldering Lugs for Use with Copper Conductors.” Provide grounding and bonding products which are UL-listed and labeled for their intended usage.
3. IEEE Compliance: Comply with applicable requirements and recommended installation practices of IEEE Standards 80, 81, 141 and 142 pertaining to grounding and bonding of systems, circuits and equipment.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.6 SEQUENCING AND SCHEDULING
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.7 PROJECT SITE CONDITIONS
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.8 WARRANTY
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.9 SPECIFICATION RESPONSE
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.10 DEFINITIONS
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL
A. Telecommunications Main Grounding Bus (TMGB).
1. Provide (1) 24-inch x 4-inch x ¼-inch (600mm x 100mm x 6mm) tinned copper UL listed busbar with pre-drilled two-hole bonding lugs.
2. Pre-drilled holes shall be primarily for 4 AWG two-hole bonding lugs. Holes shall be a nominal diameter of 5/16-inch (8mm) with 5/8-inch (16mm) between the holes centerline.
3. TMGB shall also have a minimum of (6) pre-drilled two-hole lug points for #3/0 AWG bonding lugs. Holes shall be a nominal diameter of 7/16-inch (11mm) with 1-inch (25mm) between the holes centerline.

4. TMGB shall have isolated stand-offs to provide a minimum 1-inch clearance off of wall.

B. Telecommunications Grounding Bus (TGB).
1. Provide (1) 24-inch x 4-inch x ¼-inch (600mm x 100mm x 6mm) tinned copper UL listed busbar with pre-drilled two-hole bonding lugs.
2. Pre-drilled holes shall be primarily for 4 AWG two-hole bonding lugs. Holes shall be a nominal diameter of 5/16-inch (8mm) with 5/8-inch (16mm) between the holes centerline.
3. TGB shall also have a minimum of (6) pre-drilled two-hole lug points for #3/0 AWG bonding lugs. Holes shall be a nominal diameter of 7/16-inch (11mm) with 1-inch (25mm) between the holes centerline.
4. TGB shall have isolated stand-offs to provide a minimum 1-inch clearance off of wall.

C. Conductors.
1. The minimum TBB conductor size is 6 AWG, but consideration shall be given to using 3/0 AWG conductor, as per the J-STD-607-B TBB sizing table shown below.

<table>
<thead>
<tr>
<th>Grounding Conductor Size (AWG)</th>
<th>dc Resistance Per 100 ft (Copper Conductor)</th>
<th>Short-Time Rating (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>0.077800</td>
<td>391</td>
</tr>
<tr>
<td>6</td>
<td>0.049100</td>
<td>621</td>
</tr>
<tr>
<td>4</td>
<td>0.030800</td>
<td>988</td>
</tr>
<tr>
<td>3</td>
<td>0.024500</td>
<td>1245</td>
</tr>
<tr>
<td>2</td>
<td>0.019400</td>
<td>1571</td>
</tr>
<tr>
<td>1</td>
<td>0.015400</td>
<td>1981</td>
</tr>
<tr>
<td>1/0</td>
<td>0.012200</td>
<td>2499</td>
</tr>
<tr>
<td>2/0</td>
<td>0.009670</td>
<td>3150</td>
</tr>
<tr>
<td>3/0</td>
<td>0.007660</td>
<td>3972</td>
</tr>
<tr>
<td>4/0</td>
<td>0.006080</td>
<td>5008</td>
</tr>
<tr>
<td>kcmil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>0.005150</td>
<td>5917</td>
</tr>
<tr>
<td>300</td>
<td>0.004290</td>
<td>7101</td>
</tr>
<tr>
<td>350</td>
<td>0.003670</td>
<td>8284</td>
</tr>
<tr>
<td>400</td>
<td>0.003210</td>
<td>9467</td>
</tr>
<tr>
<td>500</td>
<td>0.002580</td>
<td>11834</td>
</tr>
</tbody>
</table>

AWG = American wire gauge
dc = Direct Current
kcmil = Thousand circular mils

a. Determine the size of the building’s AC grounding electrode conductor (GEC) for the electrical service. If the size is unknown or indeterminable, assume a 3/0 AWG GEC.
b. Determine the length of the TBB.

c. Divide 40V by the Short-Time Ampere Rating of the GEC. The result is the maximum resistance value for any TBB length.

d. Normalize the results to 100’ by dividing the maximum resistance value by 0.5 for 50’, 1 for 100’, 2 for 200’ 3 for 300’, etc. Use this calculated resistance value in the next step.

e. Refer to the table above and compare the calculated resistance value with the DC resistance values per 100’. Select the DC resistance value that does not exceed the calculated resistance value created above. The associated conductor size is the calculated TBB size.

f. The table below may be used as a planning guide for estimating the TBB size prior to using the calculated method above.

<table>
<thead>
<tr>
<th>TBB Linear Length (Feet)</th>
<th>TBB Size (AWG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 13</td>
<td>6</td>
</tr>
<tr>
<td>14 to 20</td>
<td>4</td>
</tr>
<tr>
<td>21 to 26</td>
<td>3</td>
</tr>
<tr>
<td>27 to 33</td>
<td>2</td>
</tr>
<tr>
<td>34 to 41</td>
<td>1</td>
</tr>
<tr>
<td>42 to 52</td>
<td>1/0</td>
</tr>
<tr>
<td>53 to 66</td>
<td>2/0</td>
</tr>
<tr>
<td>Greater than 66</td>
<td>3/0</td>
</tr>
</tbody>
</table>

2. A TBB may be an insulated conductor. Each telecommunications bonding conductor (from equipment) shall be a 6 AWG insulated conductor, with distinctively green colored insulation. The TBB used to bond cable tray shall be uninsulated, 6 AWG minimum.

D. Connectors.

1. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

2. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

3. Welded Connectors: Exothermic-welding kits of types recommended by Cadweld (or approved equal manufacturer) for materials being joined and installation conditions.

4. Compression Fittings: All cable splices from bonding backbone to tie cables shall use irreversible compression fittings to join cable ends.

E. Grounding Electrodes.

1. Ground Rods: Copper clad steel; 3/4 inch by10 feet (19 mm by 3 m) in diameter.

2. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Whenever two or more vertical TBBs are used in a multistory building, the TBBs shall be bonded together with a Grounding Equalizer (GE) at the building’s top floor and at a minimum of every third floor in between.

B. The TBB, GE, TMGB, and TGB shall be marked with nonmetallic labels, as specified by OIT.
C. The TBB shall be installed in its own pathway, independent of the OIT pathways.

D. Telecommunications connections shall be at 3 Ohms or less.

E. The TBB shall be placed without splices. Joined segments of a TBB shall be connected using irreversible compression-type connectors, exothermic welding, or equivalent. All joints shall be adequately supported and protected from damage. TBBs shall be placed so they avoid bends, curves, and diverts. That is, straight and linear TBB runs are required.
SECTION 27 05 28 - PATHWAYS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 REFERENCES

A. General provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections.

B. Architectural, Electrical, and Technology Drawings. Other systems drawings may apply. Division 26 Basic Electrical Materials and Methods sections apply to work of this section.

1.2 SUMMARY

A. Systems Performance Requirements

1. Provide pathways for converged low voltage systems such as telephone, data networking, security access control, closed circuit TV, community antenna TV, building automation systems, overhead-paging systems, and similar systems. Coordinate all pathways with the Office of Information Technology (OIT). Systems outside this scope require separate cable trays.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of contract and Division 1 Specification Section.

B. Product Data for the following products:

1. Raceways and fittings.
2. Wireways and fittings.
3. Boxes and fittings.

C. Installation Instructions: Manufacturer’s written installation instructions for wireway, surface raceway, and nonmetallic raceway products.

D. Submit a combination ductwork, piping, and cable tray plan for coordination, providing section views of areas as required, in accordance with the requirements of Section 26 05 00.

1.4 QUALITY ASSURANCE

A. Electrical Component Standard: Components and installation shall comply with NFPA 70 “National Electrical Code.”

B. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.

C. UL Compliance and Labeling: Comply with applicable requirements of UL standards pertaining to electrical raceway systems. Provide raceway products and components listed and labeled by UL.

D. Manufacturers: Firms regularly engaged in manufacture of electrical boxes and fittings, of types, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than five years.

E. Installer’s Qualifications: Firms with at least five years of successful installation experience on projects utilizing electrical boxes and fittings similar to those required for this project.
F. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wiring boxes and fittings.

G. UL Compliance: Comply with applicable requirements of UL 50, UL 514-Series, and UL 886 pertaining to electrical boxes and fittings. Provide electrical boxes and fittings which are UL-listed and labeled.

H. NEMA Compliance: Comply with applicable requirements of NEMA Stds/Pub No.’s OS1, OS2 and PUB 250 pertaining to outlet and device boxes, covers and box supports.

I. Federal Specification Compliance: Comply with applicable requirements of FS W-C 586, “Electrical Cast Metal Conduit Outlet Boxes, Bodies, and Entrance Caps.”

1.5 DELIVERY, STORAGE, AND HANDLING
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.6 SEQUENCING AND SCHEDULING
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.7 PROJECT SITE CONDITIONS
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.8 WARRANTY
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.9 SPECIFICATION RESPONSE
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.10 DEFINITIONS
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Acceptable Manufacturers: subject to requirements, provide products by the following:
   1. Chalfant Manufacturing Company
   2. B-Line Systems, Inc
   3. Square-D Company
   4. TJ Cope, Inc.

2.2 GENERAL MATERIALS
A. Ladder Type Cable Tray:
   1. Description: NEMA VE 1, Class 20C ladder type tray, ventilated with solid sides.
   2. Material: Aluminum that complies with the Aluminum Association’s alloy 6063-T6 for rails, rungs, and cable trays and alloy 5052-H32 or alloy 6061-T6 for fabricated parts.
   3. Protect steel hardware against corrosion by galvanization according to ASTM B 633 or cadmium plating according to ASTM B 766.
4. Finish: fabricate cable tray products with rounded edges and smooth surfaces
5. Width:
   a. 24-inch in main corridors.
   b. 18-inch feeders.
   c. Minimum width is 12-inches
7. Rung Spacing: 9-inch
8. Load: 200 pounds/foot minimum.
10. Length: 14-foot sections maximum, 12-foot sections preferred.
11. Provide manufacturer's standard components such as clamps, 90-degree bends, tees, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and grounding straps.
12. Wire Basket shall not to be used on campus.
13. Capacity of cable tray per NEC:

<table>
<thead>
<tr>
<th>Cable tray width, inches</th>
<th>Cable tray depth, inches</th>
<th>&quot;Thick&quot; Cat 6 cable diameter, inches</th>
<th>Cat 6 cable area, inches</th>
<th>Square inches in cable tray</th>
<th>Number of Cat 6 cables supported in cable tray</th>
<th>Number of Cat 6 cables per NEC 50%* maximum fill</th>
</tr>
</thead>
<tbody>
<tr>
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* NEC (2008) para 392.9(B).

B. Conduit:
   1. Refer to Section 26 05 33 – Raceway and Boxes for Electrical Systems, for conduit requirements.

C. Pull Boxes:
   1. Description: galvanized code-gauge sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws, and washers.
   2. Refer to Part 3 – Execution for additional requirements.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Ladder Type Cable Tray
   1. Install in accordance with manufacturer's instructions.
2. Install metallic cable tray in accordance with NEMA VE 1.
3. Install cable tray in accordance with NEMA FG 1.
4. Support trays in accordance with Section 26 05 29. Provide supports at each connection point, at the end of each run, and at other points to maintain the proper loading rate. All-thread supporting cable tray shall be covered 12-inches from the base of support to prevent cable damage during installation.
5. Use expansion connectors when the cable tray run exceeds 90-feet or where required.
6. Remove burrs and sharp edges from cable tray.
7. Make cable tray connections and changes in direction and elevation using standard fittings. Cable tray shall use factory T’s, sweeps, and interconnections. The cable tray shall be continuous, without gaps, opening, or breaches.
8. Install cable tray to facilitate cable placement; access to the cable tray should not be restricted.
   a. All overhead and beneath floor infrastructure collisions should be presented in 3d CAD to the OIT PM for their review and routing approval.
   b. A minimum of 12-inches access headroom shall be provided and maintained above the cable tray.
   c. A minimum of 3-inches of clearance shall be maintained below the cable tray.
   d. Clear working space adjacent to the cable tray shall be 30-inches.
   e. Desired cable tray clearance from fluorescent light fixtures is 24-inches when parallel and 12-inches when crossing.
   f. Cable tray installation height shall not exceed 11-feet (top of tray). Contractor shall coordinate any exceptions with the University, Architect and Engineer.
   g. Coordinate resolution of obstructions with OIT.
9. Seal cable tray penetrations through fire and smoke barriers according to Section 26 05 29.
   a. Cable tray shall be unbroken and suitably firestopped with re-enterable firestopping when passing through a firewall. Trade Size 4” sleeves shall be required for connection of cable tray through walls. OIT approved mechanical firestopping may be substituted for approved nonmechanical firestopping. OIT approves all firestopping substitutions.
10. Ground and bond cable tray at each section connection as per the provisions of Section 27 05 26.
    a. Provide continuity between cable tray components.
    b. Use anti-oxidant compound to prepare aluminum contact surfaces before assembly.
    c. Provide a 6 AWG bare copper equipment grounding conductor through entire length of cable tray; bond to each component.
    d. Bonding connections to cable tray may be made using mechanical or exothermic connectors.
    e. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. Use those specified in UL 486A if manufacturer’s torque values are not indicated.
11. Warning Signs:
    a. Install warning signs on 50-foot centers along cable tray, located to be visible.
    b. Engraved Nameplates: 1/2-inch high black letters on yellow laminated plastic nameplate, engraved with the following wording: Warning! Do not use cable tray as walkway, ladder, or support. Use only as mechanical support for OIT low voltage cables, conduits, and innerducts.

B. Conduit
1. Telecommunications conduits shall maintain large bends and sweeps. Provided below are the ratios for minimum conduit bend radius to conduit size diameter.
   a. 2-inches (50mm) and smaller: 6:1
   b. Larger than 2-inches (50mm): 10:1
2. A 2” minimum reamed and bushed conduit shall be provided from the cable tray to each room. This entrance sleeve shall be shared by all low voltage systems entering the room. A larger sleeve, as specified by OIT, may be required depending upon the room’s size and low voltage requirements.
3. A 1” conduit shall be used to provide a pathway inside the wall to each work area outlet. The conduit shall be stubbed out to the top of the wall and be physically oriented towards the floor’s cable tray. The conduit end shall be reamed and bushed.

4. If due to obstructions, limited access ceilings, or in clinical areas, conduit shall be used in lieu of J-hooks. All conduit runs shall be coordinated with and approved by OIT.
   a. All overhead and beneath floor infrastructure collisions should be presented in 3d CAD to the OIT PM for their review and routing approval.
   b. No section of conduit shall be more than 100’ in length or contain more than two 90° bends between pull boxes or pull points.
   c. Boxes shall not be used in lieu of bends. Electrical 90° elbows (type LB) are not permitted. Corresponding conduit ends must be aligned within boxes.
   d. All conduit ends shall be reamed and bushed.
   e. Conduit shall comply with NEC and local codes, standards, and specifications. OIT may stipulate additional specifications as required.
   f. The bend radius for < 2” conduits should be 6 times the internal diameter of the conduit. Conduits over 2” OD shall have a bend radius at least 10 times the internal diameter of the conduit. Wide sweeps shall be used for all conduits over 2”.
   g. Polyl ine pull strings with a strength rating of 200 pounds shall be provided for all conduit runs.
   h. Work area outlets. A work area telecommunications outlet shall be a four-plex, deep box with a single-gang mud ring unless otherwise specified during design.
   i. Building backbone. Building backbone (riser) conduits shall be Trade Size 4” conduit, minimum. Measured pulling tape shall be provided in all horizontal or vertical building backbone conduits.

C. J-Hooks
   1. From the stubbed work area conduit, J-hooks shall be provided and installed by the cable installer to provide a pathway to the cable tray.
      a. The section of conduit minimum J-hook size is 2”.
      b. J-hooks are required every 48” to 60” along the pathway.
      c. Individual J-hooks may support no more than 50 cables.
      d. J-hooks shall not be shared with other low voltage systems. That is, all other low voltage systems require their own J-hook pathway. J-hook support rods may be shared at pathway crossings or where approved by OIT beforehand.
         a. When J-hook support rods are shared at crossings or at OIT approved locations, a minimum clearance of 12” is needed between low voltage J-hooks and telecommunications J-hooks.
         b. Telecommunications J-hooks shall be placed at the bottom of any shared support rod to facilitate frequent moves, adds, and changes.
      e. Telecommunications J-hook wire supports shall be distinguished by their blue color.
      f. J-hook wire supports shall be secured at both ends as per NEC 300.11.

D. Junction and Pull Boxes:
   1. Provide galvanized code-gauge sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws, and washers. Pull boxes installed in finished spaces must be flush mounted cabinets provided with trim, hinged door and flush latch and lock to match flush mounted panel board trim. Exact size shall meet minimum industry standards based on conduit quantities and stacking arrangement, as indicated in the table below:
2. Size: Provide pull and J-boxes for telecommunications, signal, and other systems at least 50% larger than would be required by article 370 of NEC, or as indicated. Locate boxes strategically and provide shapes to permit easy pulling of future wires or cables of types normal for such systems

3.2 TESTING, CLEANING AND CERTIFICATION

A. Test the installed cable tray by performing the following.
   1. Visually inspect joints and connections for mechanical continuity.
   2. Measure ground resistance of each cable tray system from the most remote element to the point where connection is made to service disconnect enclosure grounding terminal. Record results in ohms.
   3. Certify and report results of inspection and electrical connectivity tests in writing to the university Program Manager and OIT department.

END OF SECTION 27 05 28
SECTION 27 51 00 - DISTRIBUTED AUDIO-VIDEO COMMUNICATION SYSTEMS

PART 1 - GENERAL

1.1 REFERENCES
   A. General provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections.
   B. Architectural, Electrical, and Technology Drawings. Other systems drawings may apply. Division 26 Basic Electrical Materials and Methods sections apply to work of this section.

1.2 SUMMARY
   A. Section 27 51 00 describes the codes, standards, specifications, recommendations, and practices required for Emergency Notification LED Boards placement and installation at The University of Colorado Denver | Anschutz Medical Campus (the University). Section 27 51 00 applies to all university campuses.

1.3 SUBMITTALS
   A. General: Submit the following in accordance with Conditions of contract and Division 1 Specification Section.
   B. Product Data for the following products:
      1. LED Board.
   C. Installation Instructions: Manufacturer’s written installation instructions for wireway, surface raceway, and nonmetallic raceway products.

1.4 QUALITY ASSURANCE
   A. Electrical Component Standard: Components and installation shall comply with NFPA 70 “National Electrical Code.”
   B. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.
   C. UL Compliance and Labeling: Comply with applicable requirements of UL standards pertaining to electrical raceway systems. Provide raceway products and components listed and labeled by UL.
   D. Manufacturers: Firms regularly engaged in manufacture of electrical boxes and fittings, of types, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than five years.
   E. Installer’s Qualifications: Firms with at least five years of successful installation experience on projects utilizing electrical boxes and fittings similar to those required for this project.
   F. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wiring boxes and fittings.
   G. UL Compliance: Comply with applicable requirements of UL 50, UL 514-Series, and UL 886 pertaining to electrical boxes and fittings. Provide electrical boxes and fittings which are UL-listed and labeled.
   H. NEMA Compliance: Comply with applicable requirements of NEMA Stds/Pub No.’s OS1, OS2 and PUB 250 pertaining to outlet and device boxes, covers and box supports.
I. Federal Specification Compliance: Comply with applicable requirements of FS W-C 586, “Electrical Cast Metal Conduit Outlet Boxes, Bodies, and Entrance Caps.”

1.5 DELIVERY, STORAGE, AND HANDLING
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.6 SEQUENCING AND SCHEDULING
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.7 PROJECT SITE CONDITIONS
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.8 WARRANTY
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.9 SPECIFICATION RESPONSE
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.10 DEFINITIONS
A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. LED Board
   1. Inova – OnAlert
   2. Inova - Lightlink

PART 3 - EXECUTION

3.1 LED EMERGENCY MESSAGING BOARD INSTALLATION REQUIREMENTS
A. LED Emergency Messaging Board Placement.
   1. LED Emergency Messaging Board are placed in common areas and areas where large groups congregate including but not limited to elevator lobbies, large (75+ seat) classrooms waiting rooms and all public areas that could anticipate containing 10 or more visitors.

B. Installation Practice.
   1. IT conduits and back-boxes. IT Services requires one Trade Size 1, 1-inch conduit to support data connectivity to the LED Board. Back-box shall be 2-gang deep type with single gang mud ring. Back-Box should typically be provided between 8-10ft above finished floor, coordinate final mounting location and height with the University.

C. Power Requirements
   1. LED boards are to be Power over Ethernet (PoE).

D. Communications Media.
1. All LED Board communications media is provided by the IT Services department and is managed under a separate contract.
SECTION 28 00 00 - ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

A. SECURITY DESIGN PROCESS Concept Design (5%)
   1. Two sets of drawings and two sets of specification books to the ESD and its contractor(s).
      Drawings to also be provided to security contractors in electronic format, (AutoCAD 2000 or higher, .dwg), where possible.
   2. Security requirements identified, after initial and concept design conferences:
      a. Controlled Portals
      b. Monitored Portals
      c. CCTV Surveillance
      d. High Value and High Risk Areas
      e. Interior compartmentalization needs
      f. Adjacency and Campus Integration Issues
      g. Areas of regulatory or compliance requirement
   3. Hand out worksheets and conference notes
   4. Discuss project and establish security preliminary budgets as part of the overall construction budget.

B. Schematic Design (35% documents)
   1. Two sets of revised drawings to ESD and security contractor(s) (electronic and paper)
   2. Continued participation in all design conferences
   3. Review space configuration and design narrative
   4. Security conferences with tenants to ascertain work processes, occupant flow, risk analysis, hours of operation, compartmentalization issues, public access, high value areas, etc.
   5. Security conferences with security contractor(s) to ensure security overlays are sent to architect
   6. Security conferences with the electrical contractor and the supplier of door hardware regarding the integration of components

C. Design Development (65% Documents)
   1. Two sets of revised drawings to ESD and security contractor(s)
   2. Continued participation in all design conferences
   3. Review interior building configuration and elevations
   4. Resolve security specifications and update overlays
   5. Continued refinement of project costs and schedule with security contractor(s)
   6. Construction Documents (95% Documents)
   7. Two sets of revised drawings to ESD and security contractor(s)
   8. Continued participation in all design conferences
   9. Continued audit of revised drawings to security specifications
   10. Continued revision of costs and construction schedule with security contractor(s)

D. Construction (100% Documents Final)
   1. Two sets of revised drawings to ESD and security contractor(s)
   2. Continued participation in all design conferences
   3. Construction schedule with security contractor(s)
   4. Construction delivery and coordination
   5. Participation in contractor/subcontractor site conferences

E. Accepting the Security System by ESD
   1. Review security processes and signoff requirements of GC
   2. A commissioning check list will be developed for each project
   3. A functional test of all systems before acceptance is complete.

END OF SECTION 28 00 00
PART 1 - GENERAL

1.1 SYSTEM PERFORMANCE REQUIREMENTS

A. The University of Colorado Denver | Anschutz Medical Campus Physical Security Standards

1. 1.2.2.1. The University physical security standards for the campuses set the baseline of security requirements for each building and all controlled access structures/areas. The primary objective of the physical security policies and standards is to protect people first, with property, research protocols, and intellectual property behind it.

2. When incorporated into building design, the University will enjoy a continuity of application between each building and each zone. Architectural considerations for the presentation of buildings should incorporate these standards and the CSI, as a whole, as representative of the University’s security position.

3. The University uses a layered approach to security provision. It defines this as the provision of barriers and distance between the area protected and public areas, with security provided to the object(s) of protection first and then working outward with additional layers, as needed. Layers will be added to ensure that response time by the University Police is always less than the attack time against the object(s) of protection. Barriers will allow permitted passage but will also provide a time delay or physical deterrent for non-permitted entry. Alarm, CCTV, and/or data logging by the Security Department monitors the effectiveness of these barriers. The University Police Department also monitors these barriers by foot, vehicle patrol, and remote use of the CCTV system. The greater the value or risk of the protected area, the greater the perimeter and barrier protection.

4. The standards are dynamic in that they are an appropriate and timely reaction to identified risks with reasonable mitigation to those risks, consistent with physical, technical, and fiscal restraints. As the risk changes, the associated security will react and change appropriately. However, the University will provide a baseline level of protection to all structures.

5. The standards are oriented to support the widely varied work processes; to promote the fact and perception of personal security and safety; and to address compliance with state, municipal, and industrial standards set in code, law, or policy.

6. The “Cost of Security” includes the cost of design/installation; procurement of components, monitoring of alarms and trouble alerts; response to alarms; periodic design review, and system maintenance. Indirect costs of security include the monitoring staff, the Security Badging Offices staff, training, and supplies. All primary exterior entry portals, loading dock portals, and other frequent access points in the perimeter wall will have card reader controlled access. The equipment set for these doors will include HID RP40 (CR), Von Duprin 6000 Series Electric Strikes or Locknetics Maglocks, Request for Exit device (RTE), Door Position Sensor (DSM), and Code Blue 2-button CB-3000-d Intercom Device (IC) to reach Access Control or the Police, and other components as technology, requirements and risk require. All exterior doors to all buildings will have access control or door position monitoring enabling UCD to ensure a secure perimeter of each building after the close of business. The University installs access control devices at a building’s primary entrance(s), where the area secured must limit access to a large and variable population, where the contents of the area present a high value or a high risk of injury; where after-hours access must be logged, and/or where unique circumstances require monitored access control. All buildings will have, by default, at least one card controlled door in its secure perimeter.

a. Security relative to research laboratories, and other restricted zones adjacent to public areas within the same building will have secure perimeter. All doors to the laboratory spaces will have access control devices or will be alarmed and signed for emergency exit only. Each lab will have two secure barriers: the building exterior and an interior door system. The interior doors that are alarmed and controlled will remain secured at all times to ensure that only authorized personnel can enter, that a secure fire perimeter is supported, and that the line between biological, chemical, and radioactive hazards is enforced. The Security
Department, the Fire/Safety Office, and the Environmental Health & Safety Department have an interest in the security of the laboratory perimeter.

b. All exterior secondary portals used for unrestricted daytime passage and night egress after building closure, will be monitored. These doors will have DSM and RTE. This kit will allow egress without alarm initiation but no reentry after building closure.

c. All exterior portals used for fire or emergency exit only will have DSM only. Exit at any time will initiate alarm. Entry is not permitted at any time. No exterior door hardware is installed.

d. Exterior portals that access mechanical and electrical rooms but do not allow further access into the building will be monitored with a RTE and DSM only and will have time zone alarms.

e. Interior portals that serve to restrict access to a variable, large, or logged population during or after business hours will have HID RP40 CR, Electronic Door Lock Hardware, DSM, and RTE. Depending upon the work process, these portals can be unlocked during certain hours. If the door is in the egress path and there are no mechanical over-rides on the door, a fire pull device may be required.

f. Interior portals that provide security only during non-business hours and where free flow of traffic is necessary, may be held in the open position with magnetic hold-backs (MH) which will release at a specified time allowing the door to close to secured and monitored state. These portals require MH(s) and DSM(s). Access can be via key for emergency over-ride or access control card key, depending upon the size and type of the permitted population.

g. Interior portals that secure office, classroom, electrical, mechanical, audio-visual, maintenance, conference and similar areas will typically be secured by door hardware only, tied to the keying schema of the university.

h. High Value, High Risk, or Privacy Protection Areas will be secured by the normal CR, RTE, and DSM kit with the CR replaced or supplemented by a Biometric Device (BD) that incorporates the proximity reader and digital fingerprint to gain access. Use of these devices is dependent upon the risk mitigated by the locked door. These portals will be locked and controlled at all times and may have CCTV surveillance to support the security controls.

i. Elevators, passenger and freight, may have access control features to provide floor by floor compartmentalization during or after business hours. These may include a card reader at entry floors to open a car and interior readers to support permitted access to selected floors. Supporting features may include CCTV surveillance at elevator entry points or inside the cars to record tail-gating events, movements of property, or irregular access events.

j. Fire Stairwells will have access controls to particular floors when the elevators on corresponding floors have access controls. As with elevators and all fire egress paths, the fire system will shunt any security devices in the egress path. Egress to the roof will be prevented by locked keyway only. Re-entry to intermediate floors, though not required by code, may be designed to provide escape routing should an occupant be confronted by criminal or other personal threat between the tenant and ground level egress. Where those floors are identified, a fire pull station will be installed. Initiating this alarm will summon fire and police. The Security Department and the University’s Fire Marshal will work with the Architect on this issue.

k. The CCTV and Security systems will terminate in the IT/Telecom room(s) core in each structure. Security will typically have one wall for its low voltage power supplies, controllers, etc. and a portion of the rack system for its DVR, UPS, etc. These rooms also support the fiber optic breakout, the structure’s telephone and network features. Security will bridge to the campus network in these areas.

l. The Security Department supports the widely accepted “Crime Prevention Through Environmental Design” concepts that include the security program involvement during the designs of interior, exterior, landscape, lighting, parking, loading, etc. The Security Department also supports the AIA’s “Building Security through Design” concepts that encourage early integration of risk identification and risk mitigation through seamless design features. The Security Department will contribute to the Project Team throughout
the structure’s development to ensure clear communication, quick consultation, and solid research.

7. Secure Perimeters
   a. All exterior doors to all buildings will have access control or door position monitoring enabling UCD to ensure a secure perimeter of each building after the close of business.
   b. The University installs access control devices at a building’s primary entrance(s), where the area secured must limit access to a large and variable population, where the contents of the area present a high value or a high risk of injury; where after-hours access must be logged, and/or where unique circumstances require monitored access control. All buildings will have, by default, at least one card controlled door in its secure perimeter.

PART 2 - PRODUCTS

2.1 ELECTRONIC ACCESS CONTROL SYSTEM COMMAND AND CONTROL – ACCESS CONTROL CENTER

A. C•CURE FOUNDATION SECURITY FEATURES
   1. The software suite selected to drive the integrated campus security, alarm and CCTV systems is C•CURE 8000 by Software House, a Tyco Company. The university may migrate to CURE 9000 in the future but performance and design standards will remain as described. The specifications of the software of published at the Software House website: http://www.swhouse.com/
   2. Wiring specification:
      a. Access Control:
         1) Card Reader – 1 (one) 18/6 shielded
         2) Door position switch – 1 (one) 22/4 conductor
         3) Locking hardware – 1 (one) 16/2 conductor
         4) Request to exit – 1 (one) 18/4 conductor
         5) Emergency door release - 1 (one) 18/4 conductor

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(Fiber MINIMUM RADIUS BEND 4.13 INCHES)
2.2 ESD is the primary contractor for security features on the campus. ESD will provide the equipment specifications for all security and CCTV systems.

2.3 ESD will resolve subcontractor issues regarding wire installation, etc. with the Project Manager and the General Contractor. When possible, the ESD will address the installation of all components at the terminus and the control panels but will likely utilize the General Contractor’s resources for pulling wire between the various ITS rooms and the various end points.

2.4 CARD READER DOOR SET UPS

A. Primary Doors:
   1. HID RP40 Card Readers (Exterior doors), DS150i Request to Exits, Sentrol 1076-N Door Position Switches, VonDuprin 6000 Series Electric Strikes or Locknetics Maglocks
   2. Other Doors
   3. HID RP40 Card Readers (Interior doors), DS150i Request to Exits, Sentrol 1076-N Door Position Switches, VonDuprin 6000 Series Electric Strikes or Locknetics Maglocks
   4. HID RP15 Card Readers (Mullion Mount), DS150i Request to Exits, Sentrol 1076-N Door Position Switches, VonDuprin 6000 Series Electric Strikes or Locknetics Maglocks

B. Non Card Reader Doors
   1. Electronic Controlled/Programmed
      a. DS150i Request to Exits, Sentrol1076-N Door Position Switches, VonDuprin 6000 Series Electric Strikes or Locknetics Maglocks
   2. Electronic Monitored
      a. T-REX-XL2ADT Request to Exits, ADT1076-N Door Position Switches

2.5 SECURITY SYSTEMS AND ALARM TYPES

A. Door alarm – Forced Open and Held Open alarms will be broadcast when a door is opened except by the appropriate security device and when the door is held open for more than two minutes. Overhead doors will broadcast an open alarm when open during an alarmed period

B. Intrusion Alarms – Intrusion alarms are triggered when a room or building which has a security perimeter and interior motion detection devices installed has a motion detection or perimeter breach.

C. Panic alarms – Panic alarms are installed where cash or other high value is located; where risk of injury is high or where intrusion risk is present. All alarms trigger a police or a police/EMS response to the alarm location

D. Motion Alarms – Where a device is selected to detect the presence of a person for alarm purposes, dual technology (microwave and infrared) sensors are co-located in a devices for that purpose. The type of infrared sensor installed to function as a Request to Exit device (RTE) is installed on the secure side of a door to shunt alarms upon exit.

E. Access Control for Elevators – Access to floors with controlled access will be controlled by card readers installed in the car. If the car opens to a secure floor, into secure space, a building’s roof, or other hazardous area access to that floor will be controlled.

F. Automated External Defibrillators – Provide a 22 gauge, four conductor stranded cable routed from the AED enclosure to the nearest Security Control Panel with external relay connection to the University Police. Coordinate with the University Electronic Security for terminations on both ends.

G. Uninterrupted Power Supply (UPS) must be identified for all Digital Video Recording (DVR) equipment. The UPS must be able to support the loss of power for .25 hours. It shall provide power conditioning and
EPS (Emergency Power System) buffering. The circuits supporting DVRs must also be supported by the emergency power generation system for the building.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 28 13 00
SECTION 28 23 00 - VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 SUMMARY

A. This section provides standards on the design and products to be used in facility video surveillance.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. The University of Colorado Denver | Anschutz Medical Campus uses CCTV systems as an integral part of its physical security system. Cameras may be placed on building roofs, at key buildings entries, at central interior junctions, and in areas of high value or high risk. The placement and visibility of cameras should not infer that each or any camera is monitored at all times, that a particular action or reaction may take place because of the presence of a camera, or that a camera, by itself adds to the security or safety of a particular area.

1. Closed Circuit Television (CCTV) devices whether fixed or pan, tilt, zoom (PTZ) will be placed to record access to and activity in sensitive areas; areas where cash, drugs, merchandise, and other high value items are maintained; and where personal protection, property theft, or personal safety risks are identified. These will typically be in selected interior spaces, at primary entry portals, and selected roof locations. Low or zero light cameras will be installed where surveillance is critical even in zero light conditions.

2. Certain grants, contracts, donors, work processes, etc. have unique security requirements attached to their funds, equipment being used, or processes in the university setting. The Security Department will respond to those with developments, as needed and requested with CCTV, physical security or other features to address contractual or grant mandates.

3. Emergency Communications – The University has adopted the “Code Blue” emergency telephone system placed in parking, pedestrian, selected entry portals, and other areas as noted in the Master Plans for the site. If the construction of a structure, pathway, road, etc. or the combination of adjacencies among structures increases the need for additional telephone units, these should be proposed and coordinated with the Security Department and the Police Department. The Information Technology Department is responsible for this telephone system, although placement and selection is coordinated with the Security Department. Exterior poles should include support for PTZ cameras mounted on the standard “J” hook accessory.

4. Elevators, passenger and freight, may have access control features to provide floor by floor compartmentalization during or after business hours. These may include a card reader at entry floors to open a car and interior readers to support permitted access to selected floors. Supporting features may include CCTV surveillance at elevator entry points or inside the cars to record tailgating events, movements of property, or irregular access events.

5. The CCTV and Security systems will terminate in the IT/Telecom room(s) core in each structure. Security will typically have one wall for its low voltage power supplies, controllers, etc. and a portion of the rack system for its DVR, UPS, etc. These rooms also support the fiber optic breakout, the structure’s telephone and network features. Security will bridge to the campus network in these areas.

6. New Construction, Remodeling and Renovation Standards
a. The University has set construction and renovation standards in the areas of physical and electronic security to enhance the efficiency and effectiveness of new construction, renovation, relocation of offices and labs; and the integration of all work functions on both campuses. This document (CSI Division 280000) resides with the Facilities Projects Department and is distributed it to all new building design teams. As projects are developed, the security requirements are incorporated from the concept designs through to commissioning of the structure.

B. Personnel Security

1. At each primary door entry and in all parking areas, “Code Blue” pylons have been installed.
PART 2 - PRODUCTS

2.1 Closed Circuit T.V. Cameras provided by the University

A. Camera Wiring:
   1. Fixed Cameras require
      a. RG6/18-2 Siamese for runs 750’ or less
      b. RG59/18-2 Siamese for runs 500’ or less
      c. Other wiring requirements will be determined by application
      d. All Camera wire jackets to be Grey in color
   2. PTZ Cameras require
      a. RG6/18-2 Siamese for runs 750’ or less (Video)
      b. RG59/18-2 Siamese for runs 500’ or less (Video)
      c. 18-2 type wiring (Data) Or as specified by the Manufacturer(s)
      d. Other wiring requirements will be determined by application
      e. All Camera wire jackets to be Grey in color
      f. ADD AC Power requirements (protected box at roof level)

2.2 CCTV Monitor:

A. Provided by the University.

2.3 Digital Video Recording

A. American Dynamics Intellex, rack mount, 16 channel, v4.1 or higher software, premier 480GB, NTSC provided by the University.

B. Location
   1. AC Power and Data Drop for Monitor. Back Box kit, hang flush on wall.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 28 23 00
SECTION 28 31 00 - FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 DESIGN REQUIREMENTS

A. Provide a microcomputer based system using multiplex techniques for alarm reporting, central monitoring, signaling, and selection of audible and visual signal circuits. The fire alarm system should be capable of making emergency announcements. The fire alarm subcontractor should work closely with the campus Information technology department working through the University Project Manager to make this work.

B. Provide individually identified fire alarm sensors; pull stations, indicating devices, and compatible monitor and control devices. Provide a unique address for each device 8 digit only, with operator-assigned English language descriptor.

1. The system shall include the following major components
   a. Fire Alarm Control Panel (EST3)
   b. Fire Alarm Annunciator Panel (FAAP) and LCD Display.
   c. Fire Alarm Voice/Evacuation Panel (FVEP)
   d. Fire Alarm Computer Terminal (FACT) – FACT refers to the individual building and University Police Building FACT.
   e. Fireman Two Way Telephone Panel (FTP) – If required by the building type.
   f. Digital Alarm Communicator Transmitter (DACT) (3-Mod Comp)
   g. Interface with campus overhead Emergency Paging system with Central Station monitoring computer controls.

2. Conventional fire alarm initiating devices (smoke detectors, heat detectors, manual stations, water flow and tamper switches, pressure switches) shall each be individually addressable via, and shall report to the FACP.

3. Control relays shall be individually commanded by the system to respond automatically in case of an alarm by related sensors or other devices. Manual control of fans, dampers and required relays shall be provided, as well as automatic control where required by code. Control sequences shall be as indicated on related mechanical systems control drawings.

C. The system shall operate as a low voltage, zone-annunciated Fire Management System and shall include the following subsystems:

1. FACP to monitor addressable initiating and control devices, annunciate the alarm device exact location, initiate alarm and evacuation signals, and capture and recall elevators.

2. FACP and Associated Auxiliary panels shall be provided with Class “A” wiring.

D. Provide UL listed system. If required as a condition requisite to establishing UL listing of the entire installation as a system, the Contractor shall arrange for, and pay all costs associated with, any required off-site or on-site review, supervision, and/or inspection which may be required for gaining such UL listing.

E. Conform to the following NFPA requirements:

1. Initiating Device Circuits (IDC) shall be Class B

2. The Signaling Line Circuits (SLC) shall be configured as follows:
   a. Class A for signaling line circuits connecting intelligent devices to the FACP.
   b. Loss of connectivity between FACP and the facility's Central Control FACP shall not hamper functions of the fire alarm system within the building.

3. The Notification Appliance Circuit (NAC) shall be Class B
F. ANSCHUTZ MEDICAL CAMPUS SYSTEM LAYOUT
1. General:
   a. All campus buildings will be equipped with a FACP. Locate near the main entry and a FVEP located near the FACP per the building design, for all non high-rise buildings.
   b. Each FACP shall be networked into the campus network and accessible from the Campus FACT. Any FVEP shall be accessed from the Campus FCC FVEP microphone and/or the Campus Police Station FVEP microphone.
   c. One FACP and FACT in one university high-rise building FCC and one university high-rise building FCC will be designated alternate locations for the Campus FCC FACP. All information residing in the FACP/FACT of the Campus will be duplicated at these two locations.
   d. A FACT with FAP or a FAAP with LCD indicating building in alarm shall be located at the University Police Building. The Police Station shall be capable of accessing any FVEP via local microphone.
   e. Every building will be equipped with a weatherproof speaker/strobe located at each exterior door.
   f. Include the Following Front Panel Controls:
      1) Each floor shall have a disable button
      2) Elevator disable
      3) Fan/shut-down disable
      4) Pager disable
      5) Door disable
      6) Separate speaker and strobe disable
      7) Manual page by floor
      8) NETCOM DISABLE
      9) BAS DISABLE

G. Provide interface with the Building Automation System to report all “alarm” and “supervisory” actions. Refer to Division 23.

1.2 PERFORMANCE REQUIREMENTS

A. General:
1. Normal operator interface, through the FACP located in each individual building where required, and at the designated FACT located in the Anschutz Medical Campus University Police Building in the Police Dispatch. All system early-warning pre-alarm, alarm, and trouble messages shall be annunciated on the FACT in a color-graphic format with English language descriptors.

B. High-Rise Buildings.
1. The fire alarm sequence of operation shall be in accordance with the requirements for high-rise buildings, including but not limited to the following:
   a. The alarm and activate the strobes for the floor in alarm and the floors above and below.
   b. Initiate stair pressurization and where used, initiate pressurization of the floors above and below the floor in alarm.
   c. Release of stair, held-open doors, and re-entry doors.
   d. Upon activation of the elevator, elevator shafts, or elevator lobby detectors, recall the elevators to the main exit level or alternate floor.
   e. Activate refuge area communications link.
   f. Annunci ate the alarm to the building FACP, and FAAP, and to University Police FACT.
   g. Annunci ate the alarm condition and location to the building FAAP and local floor FAAP.
2. The Command Center of the High Rise Buildings shall also be equipped, under another contract, with the following remote status/control panels:
   a. Buildings electrical distribution system.
   b. Building fire pump.
   c. Elevator status and control panel.
d. Building voice paging system and/or voice evacuation system (i.e., Office Building) via zone interface panel and microphone.
e. CCTV system monitors and keyboard.
f. Smoke control panel.
g. Generator control panel.

3. The FD will use these panels for viewing or controlling each of the above systems.

C. The FD will respond to the FACP of the building in alarm and to the Campus Police. The Campus Police FACT shall be automatically activated into the graphics mode to show the current status of all devices in alarm. The FD will take command of the Building's FACT to monitor the current response to the fire alarm condition. Using a "mouse driven" graphic menu, the FD shall be able to "zoom in" or "zoom out" of the graphic screens to view the current alarm condition.

1. The FD will use the building's FCC PC graphic system to view and control the response of the fire alarm system by viewing special graphic screens such as:
   a. A smoke control system status and control screen.
   b. Any building within the complex connected to the fire alarm system.
   c. Any preprogrammed screen existing within the fire alarm system.
   d. Or other specialty screens that may be created at the request of the university Facilities Operations.

2. Using the assigned FD Identification Code (ID password), the FD may use the FCC PC to alter the preprogrammed fire fighting response to the present alarm condition. A printer will provide hard copy documentation of all alarm conditions, ID password log on commands, and the system response to the specific fire alarm condition.

D. The Campus Control Center fire alarm computer will provide monitoring and secondary back up of the fire alarm computers located in the various fire command centers. If an equipment trouble alarm is initiated from a fire alarm device, it shall be reported at the FCC FACP of the building in alarm and the Campus Control Center PC.

E. If a fire alarm condition is received and the FD cannot initiate an appropriate response from the building's FCC PC (i.e., fire in the Buildings' FCC room, or a failure of the FCC PC), then an override ID password command can be used by the FD to make any system PC the primary PC for the manual fire fighting override response. The selected PC shall be able to alter a building's preprogrammed response to the alarm condition. The selected PC shall be able to access and control all PC graphic screens that reside within the system.

F. It shall be possible for all authorized personnel, using the proper ID password, to place the facility into smoke control operation through the graphic screens from the University Police (FACT), or the Building's FCC FACP.

G. Automatic Actions:

1. Activation of an alarm-initiating device, as specified herein shall cause the following:
   a. Annunciation of the alarm condition, type, and device address at the FACP, FACT and FAAP in a LCD format at the building FAAP. An audible signal shall sound and the alarm condition shall flash until acknowledged. The alarm condition and its location shall also be displayed at the University Police FACP, FACT, and FAAP per the building design.
   b. The appropriate audio and visual alarms shall be transmitted throughout the building in alarm or to predetermined zones of the building in alarm.
   c. Disable the elevator call system and recall the elevators to the level of discharge exit or to the alternate floor.
   d. Initiate smoke control procedures and functions automatically (position dampers and control fans) from the building FACP.
   e. Release self-closing fire and smoke doors in specified control zone when the system goes into alarm.
   f. Provide control relay at each access control panel to unlock all secured doors in activated control zone.
Provide digital paging notification to select university personnel as determined by the University Project Manager.

2. Provide smoke detector circuits with alarm verification with field-adjustable time from 0 to 60 seconds. Only verified alarms shall initiate the specified sequences.

3. Activation of a sprinkler valve supervisory switch shall initiate supervisory alarm at the corresponding building FACP, FAAP, FACT, and FAP and initiate a supervisory alarm signal at the University Police FACT. Supervisory alarms shall be differentiated from a trouble condition on the circuit.

4. A break in the initiating circuit or detector power wiring shall be annunciated as a trouble condition on the building FACP and the University Police FACT.

5. A break in the audio/visual circuit wiring shall be annunciated as a trouble condition on the building FACP and the University Police FACT.

H. Failsafe Operation: To increase the system's ability to survive damage from fire, malicious or accidental damage, premature component failure, etc., the fire alarm system shall provide the following functionality:

1. Each building FACP shall operate in a stand-alone manner, independent of any other FACP or FACT. The building FACP shall contain the complete data file for all connected devices, regardless of the building, and shall operate the same way whether connected to any other FACP or FACT. This includes:
   a. Annunciation of device address and condition. One hundred percent of all connected devices shall be capable of operating for alarm simultaneously.
   b. Logical Point Grouping annunciation and control. Each Logical Point Group shall contain up to 15 physical points and shall be capable of initiating a sequence of control actions.
   c. Event-initiated control, signaling and/or annunciation sequences. One hundred percent of all connected devices shall be capable of being operated simultaneously.
   d. Priority display of multiple alarms.
   e. Complete supervision of all connected devices with no degraded operation.
   f. Complete reset capabilities at FACP and FACT.

2. Standby batteries capable of operating the FACP, FACT (except those supported by non-interruptible power supply systems), FAAP, FVEP, smoke detectors and alarm horns, strobes, secondary PC terminals, video display units and printers, shall be provided to automatically back up the emergency power source. The system shall have the capacity to operate FACP, as required per NFPA PCs for two hours, and then operate the fire alarm indicating devices for at least 15 minutes, per NFPA requirements. When commercial power is restored, the system shall transfer automatically to primary power. System power supply shall be equipped with battery charging circuits sufficient to recharge fully depleted batteries to within 70 percent of their maximum capacity within 12 hours.

3. System operating software and data file shall be resident in nonvolatile memory. Loss of power, momentary or for a sustained period shall not require reloading of the software.

4. All plug-in circuit boards shall be electrically supervised to assure that the proper board is in the proper position. Systems that use electrical continuity to supervise the presence of plug-in boards, but that do not assure that board positions have not been exchanged, shall provide additional means for the specified supervision, beyond that provided by locking covers.

5. The FACT shall be provided with battery backup or individual dedicated UPS.

I. 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</th>
<th># Of Conductors</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiating Circuits</td>
<td>(+) Red (+) Black</td>
<td>2</td>
<td>18 (THHN)</td>
<td></td>
</tr>
<tr>
<td>Signaling Circuits</td>
<td>(+) Red (+) Black</td>
<td>2</td>
<td>16 Twisted</td>
<td></td>
</tr>
<tr>
<td>Speaker Circuits</td>
<td>(+) Orange (+) Brown</td>
<td>2</td>
<td>14 Twisted</td>
<td></td>
</tr>
<tr>
<td>Strobe Circuits</td>
<td>(+) Yellow (+) Blue</td>
<td>2</td>
<td>14 Twisted</td>
<td></td>
</tr>
<tr>
<td>Fire Fighter Phone Circuit</td>
<td>(+) Red (+) White</td>
<td>2</td>
<td>14 Twisted/ Shielded</td>
<td></td>
</tr>
<tr>
<td>Fire Fighter Phone Riser Circuit</td>
<td>(+) Red (+) White</td>
<td>2</td>
<td>14 Twisted/ Shielded</td>
<td></td>
</tr>
<tr>
<td>RS-485 Circuit</td>
<td>(+) Blue (+) Gray</td>
<td>2</td>
<td>16 Twisted</td>
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<td>Damper Control</td>
<td>(+) Red (+) Black</td>
<td>2</td>
<td>14 THHN</td>
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<td>AHU Shutdown Circuit</td>
<td>(+) Red (+) Black</td>
<td>2</td>
<td>14 THHN</td>
<td></td>
</tr>
<tr>
<td>24VDC Power Circuit</td>
<td>(+) White (+) Black</td>
<td>2</td>
<td>14 THHN</td>
<td></td>
</tr>
<tr>
<td>Fire Alarm Remote Light Circuit</td>
<td>(+) Red (+) Black</td>
<td>2</td>
<td>18 THHN</td>
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<tr>
<td>Speaker Phone Cut Out Circuit</td>
<td>(+) Orange (+) Brown</td>
<td>2</td>
<td>14 Twisted</td>
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</tr>
<tr>
<td>Low Level Audio Riser Circuit</td>
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<tr>
<td>High Level Audio Riser Circuit</td>
<td>(+) Red (+) Black</td>
<td>2</td>
<td>14 Twisted</td>
<td></td>
</tr>
<tr>
<td>Door Holder Circuit</td>
<td>(+) Red (+) Black</td>
<td>2</td>
<td>14 Twisted</td>
<td></td>
</tr>
</tbody>
</table>

J. Intelligent Features:
1. The following additional features shall be provided:
   a. The fire alarm detector cleaning shall be annunciating at the FACP as a trouble condition by the device.
   b. Dual Alarm threshold for day or night settings.

K. Interface With Other Systems:
1. Interface design of fire alarm system with closed circuit television (CCTV) system and FO signal transmission system.
2. The Electronic Security Department (ESD) will provide software to interface with the CCTV and fire alarm systems. CCTV and fire alarm manufacturers shall provide software protocol, for their systems, to ESD.
3. Consultant may purchase copy of specifications for interfacing systems from the university for the purpose of determining interfacing requirements.
4. Interface voice notification with the campus RAV system.
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. Operating and Maintenance Manuals.

D. 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. Manufacturer: Company specializing in Intelligent Fire Management Systems.

B. Installer: Company with certified personnel specializing in smoke detection and fire alarm systems with five years' documented experience as a fire alarm installing contractor.

C. Fire Management system installer shall keep all smoke heads in the building covered until final building turn over. Failure to comply will mandate a complete cleaning of the individual heads on the system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Edwards System Technology (Sole Sourced)

2.2 APPROVED INSTALLERS

A. Systems Group – 800 E. 64th Ave. #17, Denver, CO (303) 298-7900
B. Convergint – 7330 S. Alton Way, Suite 12K, Centennial, CO (303) 932-0757

C. Meridian Fire and Security – 7173 S. Havana St Ste 400 Centennial CO, 80112 (303) 790-2520

D. Other Edward System Technology 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. All sensors shall be of the intelligent type and shall mount on a common base. This base shall be incompatible with conventional detectors.

E. 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.

F. The system shall be designed to operate with unshielded wire, to the maximum practicable extent. Shielded wire may be used. FO cable shall be utilized, as required or as indicated by the design documents.

G. FACPs shall be provided with tamper switches on cabinet doors to protect against unauthorized access to internal devices. The panel shall provide commandable outputs, which can operate relays or logic level devices.

H. Memory data shall be contained in EEPROM non-volatile memory. If non-volatile battery-backed RAM provides memory, removal of the board shall not cause loss of memory contents.

I. The Fire Alarm annunciator panels shall be LCD types.

J. Site Specific Customizing Software:

   1. General:

      a. Provide software and Programs with technical support and training for the university's Facilities Operations staff during installation of system and completion.

      b. Alarm display shall include, as a minimum:

         1) Indication of alarm condition, i.e. ABNORMAL OFF, HI ALARM/ LO ALARM, analog value or status, and English group and point identification such as "SMOKE DETECTOR BUILDING "A" - 2ND FLOOR- ROOM 202".

         2) A discrete per point alarm action taking message, such as "CALL MAINTENANCE DEPT. EXT 5561", of up to 480 characters.

      c. System shall automatically transmit alarm and troubles to selectable university pagers via a commercial carrier such as "AT&T Wireless".

      d. The network routing properties for a panel's common controls determine which panels will respond when an operator presses the corresponding control command switch (Reset, Alarm Silence, Panel/Trouble Silence, Drill, Alternate Sensitivity) on the 3-LCD module.
Only the panels defined in the selected network routing group will respond to the command. Any building connected by a bridge or other structure shall annunciate to its opposite number(s) alarm, supervisory, and trouble conditions via single LEDs on its front panel.

2. Point summary reports:
   a. Point summary reports shall include the current value/status and condition.
   b. Trend reports shall allow the operator to randomly select logical arrays of points.
   c. Dynamic trends shall provide up to six points and show real time activity of the associated points.
   d. Alarm reports shall be automatically issued.
   e. A custom report capability shall be provided to allow the user to format reports of any mix of text, points with status/value and descriptors, and points with status/value only.

K. Fire Alarm System Devices:
   1. General:
      a. Each device shall be assigned a unique address, 8 digit only Example (01020001). 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.
   2. Analog Sensors (Photoelectric and Thermal):
      a. Each sensor shall contain an LED, which blinks each time it is scanned by the FACP. The sensor LED is to remain illuminated to indicate alarm. All sensors not visible from the corridor shall have a remote light mounted in the corridor as shown on the drawings.
      b. Each sensor shall be capable of being tested for alarm via command from the FACP or FACT. The values of the sensor shall be displayed at building FACP and FACT, and the University Police FACT.
   3. Monitor Modules:
      a. The Monitor Module shall provide an addressable input for N.O. or N.C. contact devices such as manual stations, water-flow switches, sprinkler supervisory devices, door contacts, intrusion detectors, etc.
      b. The Module shall mount in a standard electrical box.
   4. Control Modules:
      a. The Control Module shall provide an addressable output for a separately powered alarm-indicating circuit or for a control relay.
      b. The relay contacts shall be SPST (Form "C" rated at 2 amps at 28V DC).
      c. The module shall mount in a standard electrical box.
      d. Control voltage’s connected to intelligent control relays shall not exceed 24VAC/24VDC. Isolation relays shall be used on control voltages on excess of 24VAC/24VDC.
   5. Fault Isolator Module (only if approved by the University Project Manager):
      a. The Fault Isolator Module shall detect and isolate a short-circuited segment of a fire-alarm loop.
      b. Modules shall be placed on every floor to limit the number lost addressable devices in case of a short-circuit on the intelligent circuit.
   6. Intelligent manual pull stations shall be double action is typical on campus, mounted on standard electrical box. a. For public places, use single action pull stations with "Stopper II" cover.
   7. Magnetic door holders shall be wall- or floor-mount on a standard electrical box.
   8. Linear beam smoke detectors shall have cross-zone capabilities and be provided where shown on the drawings. Detectors shall consist of a transmitter and receiver unit utilizing infrared light to detect smoke between the units. These detectors shall have discriminating circuitry to differentiate between actual smoke, momentary blockage of the beam, and long-term blockage.
      a. Contractor shall provide a weatherproof enclosure for each pair of devices, utilizing transparent panels to allow light transmission. Ensure range of detector is adequate to compensate for passage through this glass.

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L. Other Devices:
   1. Speaker/Strobes:
      a. Strobes shall be synchronized.
      b. The speaker shall provide for minimum sound level of 95 dBA at 10 feet.
   2. Analog Air Duct Detectors:
      a. Duct detectors shall be mounted exterior of duct with air sampling tube. Program duct detectors for supervisory indication only.
      b. Provide fire alarm remote light red LED, mounted on a standard plate fitted to a standard electrical box. When device is not visible, labeled plate with the name of the device served.
      c. Fire alarm remote light/test switch combination shall be utilized for each duct detector. The device shall have a red LED and two positions test switch mounted on a standard plate fitted to a standard electrical box. Plates shall be labeled with the name of the equipment served.
   5. Sprinkler Pre-action Solenoid and Deluge Valves: Installed under Division 21
   8. Relays provide addressable control and/or monitor module for each device indicated in paragraphs P. 3, 4, 5, 6 And 7 above. Include wiring to the device and to the fire alarm loop as required.
   9. Provide control relays as required to accomplish functions such as fan shutdown, damper positioning, door release, etc.
   10. Fire/Smoke dampers and smoke dampers will be provided under Division 23. The 24V wiring, including low voltage transformer P.E. switch, will be provided under Division 23. The 120V AC wiring will be provided under this section.
   11. Voice Evacuation Speaker/Strobe units shall be UL listed for use in voice evacuation systems. Audible and visual indications shall operate independently or in unison.
   12. Animal Care Facilities
      a. Provide “Silentone” horns or approved equal throughout all animal care facilities. Provide red lensed strobe in animal holding rooms.
      b. Provide speakers in the office areas of the animal facility.

M. Voice Evacuation System:
   1. The Contractor shall provide all work required for installation of a Voice Evacuation System for the buildings indicated by the drawings. Scope of this Contractor's work will be as described by this section of the specifications and as shown on the drawings.
   2. Buildings that are defined as high rise shall have the following: An Audible Alarm on the floor where that event is detected and a general message to all other floors stating, “A fire Alarm has been detected on (indicate floor number). Remain alert and evacuate if there are indications of fire.
O. Voice Evacuation System:
   1. The Contractor shall provide all work required for installation of a Voice Evacuation System for the buildings indicated by the drawings. Scope of this Contractor's work will be as described by this section of the specifications and as shown on the drawings.
   2. Buildings that are defined as high rise shall have the following: An Audible Alarm on the floor where that event is detected and a general message to all other floors stating, “A fire Alarm has been detected on (indicate floor number). Remain alert and evacuate if there are indications of fire.

   If no danger is noted, you may await further instruction. Elevators have been recalled to level 1 (or alternate floor if the fire alarm is on level 1) until the fire alarm is over.”

   3. Fire Alarm Voice Evacuation Panel (FVEP):
      a. The FVEP shall be located in conjunction with the FACP and shall provide evacuation signals, pre-recorded fire alarm messages, and one-way communication (paging) on a selective.
      b. FVEP equipment shall include the following:
         1) Voice paging, hand-held, push-to-talk microphone with dynamic noise canceling. Frequency response shall be flat within + 3 dB from 200 to 5,000 Hz.
         2) Zone paging selector switches and LED's, with one selector switch and two LED's provided for each speaker zone.
         3) "Manual Fire Evacuation Tone" switch and LED.
         4) "Silencing" fire evacuation tones (self-restoring switch) and LED.
         5) "Pre-recorded Message" switch and LED.
         6) "All Call", switch and LED, with the switch enabling the operator to simultaneously page all speaker zones on both risers.
         7) Reset switch.
         8) Lamp test switch.
         9) "Page" LED, which will light when the paging microphone is used.
         10) The FVEP shall also be equipped with LED's to indicate trouble conditions for the following:
            a) Each individual speaker zone.
            b) Amplifier, preamplifier, fire tone, pre-recorded messages, and voices paging.
         11) All switches and LED's shall be clearly identified with engraved labels.
         12) Each group of LED's shall have distinctive colors, such as:
            a) Fire Tone - Red
            b) Silence - Yellow
            c) Page - Green
            d) Trouble - Yellow
            e) Pre-recorded Message - Red
      c. The fire evacuation signal shall be applied to any specific zone automatically from the FACP or FACT, or shall be selected manually by the speaker zone switch.

   4. FVEP Audio Cabinet:
      a. 100% redundant tone generators, preamplifiers, and amplifiers shall be provided.
      b. The audio trunk shall be electronically supervised and shall be automatic switchover from one audio signal path to the other.
      c. Each amplifier module shall be provided with two 40-watt amplifiers, and shall power a minimum of 8 speaker zones.
      d. Pre-recorded message shall be programmed and recorded in a memory chip. Tape cassette players are not acceptable.
      e. The FVEP audio cabinet shall be capable of remote "All Page" activation via local microphone from the University Police Station. The system shall allow the selection of individual building or "All" buildings for "Disaster Messages".
      f. Provide capability of testing and adjusting audio amplifier outputs. Provide test switch at the FACP.
P. Spare Parts: Refer to Section 01 78 46 – Extra Stock

Materials. PART 3 - EXECUTION

3.1 INSTALLATION – FIRE ALARM

A. Fire Alarm layouts:
1. General:
   a. Provide a fire alarm system for each building.
      1) Actual detection required per building shall be determined by National codes,
         Local codes and the university CBO, whichever is more stringent.
   b. Provide shunt trip circuit breaker for connection to elevators with sprinkler red shafts.

2. Regardless of building occupancy rating, the following areas shall be provided with detection:
   a. Laboratories
   b. Electrical Rooms
   c. Mechanical Rooms
   d. Telecommunications
   Rooms e. Data Centers
   f. Dedicated Storage
   Rooms g. Kitchens

3. In general, the following type of detection shall be provided in each type of room:
   a. Photoelectric Smoke Detection:
      1) Electrical/Telecommunication Rooms
      2) Office Corridors (except where sprinkled)
      3) Offices (except where sprinkled)
      4) Laboratories
      5) Mechanical Ducts
      6) Elevator Shafts/Machine Rooms
      7) Dedicated Storage Rooms
      8) Linear Equipment
   Rooms b. Thermal Detection:
      1) Restrooms
      2) Mechanical Rooms
      3) Kitchens/Break rooms
      4) Environmental Services (Janitor) Rooms
      5) Elevator Shafts/Machine Rooms
      6) Generator Rooms
      7) Autoclaves c.
   Flame Detection:
      1) Generator Rooms

4. Provide control module at each access control panel for interface with access control system.

B. Installation shall be supervised and tested by the manufacturer of the system equipment.

C. Low Voltage/Wire and Cable: All LV/W&C shall be run in conduit in floors, walls and non accessible spaces. In hallways, LVW/C can be run in bridle rings attached to the common telecom and other low voltage system cable tray. LV/W&C must be run in a conduit sleeve, minimum 2” dia. with plastic bushings, from the point it leaves the bridle ring on the cable tray to the interior side of a room. Once the LV/W&C enters the room it can be supported from bridle rings or j-hooks. Wiring shall comply with Division 27 and approved NEC.
D. Low Voltage/Wire and Cable and Hallway Devices: LV/W&C running from the cable tray to devices in the hallway shall be protected by plenum rated flexible sleeving or flexible metal conduit. LV/W&C in sleeving or flexible metal conduit shall be supported per NEC and installed with UL approved connectors and plastic bushings on both ends.

E. Outlet pull and junction boxes shall be painted red on the exterior. F. Devices: Locate devices per ADA standards

G. 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.

H. 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.

I. If room numbers are changed or new room numbers established, the University Project Manager must be notified before implementation so that the system can be re-programmed and is accurate in the event of an alarm.

J. All devices mounted in ceiling tile to be supported by T-bar hanger bracket and appropriate box. Plaster ring is not acceptable.

K. 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 detectors to have factory dust covers installed until after the final inspection and clean up is complete.
   6. All duct detectors to have individual remote LED/test stations installed. Mount at 6’-0” AFF in main corridor adjacent to area served. Label as directed by the University Project Manager.
   7. All shielded wiring to be bonded together at each device and insulated from contact with the conduit or box.
   8. All equipment and associated wiring removed from service will be returned to the University Project Manager for proper disposal.
   9. Avoid locating detectors above countertops and/or shelving.
   10. Locate detectors at least eight feet from supply or return air diffusers.
   11. Use fixed heat detectors near autoclaves and steam sterilizers.
   12. Mount remote lights for room detectors above door to corridor, centered.

L. 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.

M. 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. The functional operation of each re-settable initiating device (manual stations, detectors, etc.) and circuit.
2. All notification appliances shall be tested for a minimum of ten minutes under normal alarm conditions.

H. 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.

I. If room numbers are changed or new room numbers established, the University Project Manager must be notified before implementation so that the system can be re-programmed and is accurate in the event of an alarm.

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1. The functional operation of each re-settable initiating device (manual stations, detectors, etc.) and circuit.

2. All notification appliances shall be tested for a minimum of ten minutes under normal alarm conditions.

3. The functional operation of each and every alarm device and circuit.

4. The functional operation of each monitored device circuit.

5. The functional operation of each control circuit, including fan controls.

6. The supervision functions of each initiating, indicating, monitoring, control and supply circuit.

7. Control station automatic signaling.

8. That all software protocol, access codes and operation instructions have been supplied.

9. 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.

3.3 COMMISSIONING (DEMONSTRATION)

A. The equipment supplier shall provide a minimum of 8 hours of system training for the university Facilities Operations personnel training for each new system.

END OF SECTION 28 31

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