



UNIVERSITY of MARYLAND BALTIMORE

ADMINISTRATION & FINANCE

DESIGN AND CONSTRUCTION SPECIFICATIONS FOR THE UNIVERSITY OF MARYLAND BALTIMORE

SCHOOL OF NURSING – 6TH FLOOR SIMULATION APARTMENTS RENOVATIONS

**SCHOOL OF NURSING, 655 W. LOMBARD STREET,
BALTIMORE, MD., 21201**

**UNIVERSITY PROJECT # 26-312
BUILDING INVENTORY No. 0833**

PROJECT SPECIFICATIONS BID SET

APRIL 8, 2026

Owner

University of Maryland, Baltimore
Design and Construction
620 W. Lexington Street, 6th Floor
Baltimore, Maryland 21201

Board of Public Works

Wes Moore, Governor
Brooke Lierman, Comptroller
Dereck E. Davis, Treasurer

Maryland General Assembly

Bill Ferguson, Senate President
Adrienne A. Jones, House
Speaker

Architect

Murphy & Dittenhafer Architects
805 North Charles Street
Baltimore, MD 21201
410.625.4823

Electrical, Fire Alarm and Fire Protection Engineer

WFT Engineering, Inc.
1801 Research Blvd., Suite 100
Rockville, MD 20850
301.230.0811

Mechanical and Plumbing Engineer

Burdette Kohler Murphy Associates
6300 Blair Hill Lane, Suite 400
Baltimore, MD 21209

IT/Data Design

Convergent Technologies Design Group
6501 York Rd, Baltimore, MD 21212
410.532.2395

Cost Estimating

Forella Group
5180 Parkstone Drive, Suite 250
Chantilly, VA 20151

TABLE OF CONTENTS – 100% Construction Documents

SPECIFICATION VOLUME I:

DIVISION 01 - GENERAL REQUIREMENTS

011000 SUMMARY OF THE WORK
010270 APPLICATIONS FOR PAYMENT
010350 MODIFICATION PROCEDURES
010400 COORDINATION
010450 CUTTING AND PATCHING
010950 REFERENCE STANDARDS AND DEFINITIONS
012000 PROJECT MEETINGS
013000 SUBMITTAL PROCEDURES
013110 SCHEDULES AND REPORTS
013800 CONSTRUCTION PHOTOGRAPHS
014000 QUALITY CONTROL
015000 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS
016000 MATERIALS EQUIPMENT DELIVERY AND STORAGE
016310 SUBSTITUTIONS
017000 CONTRACT CLOSEOUT

DIVISION 02 – EXISTING CONDITIONS

024119 SELECTIVE DEMOLITION

DIVISION 05 – METALS

NOT USED

DIVISION 06 – WOOD, PLASTICS, AND COMPONENTS

061000 ROUGH CARPENTRY
064023 INTERIOR ARCHITECTURAL WOODWORK

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

072100 INSULATION
078100 SPRAY-APPLIED FIRE RESISTIVE MATERIALS
078413 PENETRATION FIRESTOPPING
079200 JOINT SEALANTS

DIVISION 08 – OPENINGS

081113 HOLLOW METAL DOOR FRAMES
081416 FLUSH WOOD DOORS
083113 ACCESS DOORS
087000 DOOR HARDWARE
088000 GLAZING

DIVISION 09 – FINISHES

092900 GYPSUM BOARD ASSEMBLIES
093013 CERAMIC TILING
095113 SUSPENDED CEILING, CLOUD AND BAFFLE SYSTEMS
096513 RESILIENT WALL BASE AND ACCESSORIES
096519 RESILIENT FLOORING
096813 TILE CARPETING
099100 PAINTING

DIVISION 10 – SPECIALTIES

10100 VISUAL DISPLAY BOARDS
101410 SIGNAGE
102800 TOILET, AND BATH ACCESSORIES
104416 FIRE EXTINGUISHERS AND FIRE EXTINGUISHER CABINETS

DIVISION 12 – FURNISHINGS

NOT USED

DIVISION 21 – FIRE SUPPRESSION

210000 FIRE PROTECTION CONDENSED SPECIFICATION FORMAT

DIVISION 22 – PLUMBING

220000 PLUMBING CONDENSED SPECIFICATIONS FORMAT

DIVISION 23 – HVAC

230000 HVAC CONDENSED SPECIFICATIONS FORMAT

DIVISION 26 – ELECTRICAL

260000 ELECTRICAL CONDENSED SPECIFICATION FORMAT

DIVISION 27 – COMMUNICATIONS

270528.48 MULTIMEDIA CONNECTION WALL BOX
271500 COMMUNICATIONS-HORIZONTAL-CABLING

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

280000 FIRE ALARM – PROVIDED FOR THIS SUBMISSION IN OUTLINE FORMAT

END OF TABLE OF CONTENTS

SECTION 010100 – SUMMARY OF WORK

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 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Project consists of interior renovations to the north wing of the 3rd floor of the School of Nursing.
1. Project Location: 655 West Lombard Street, Baltimore, MD 21201
 2. Owner: University of Maryland, Baltimore.
- B. Contract Documents, **dated April 8, 2026** were prepared for the Project by Murphy and Dittenhafer Architects, BKM Engineering Mechanical and Plumbing , WFT Engineering Electrical and Fire Alarm , and Convergent Technologies AV/IT/Data design.
- C. The Work consists of new partitions to accommodate new programming including renovation of the two current simulation apartments to be modernized to reflect today's real-life experiences that nursing students will encounter in the field. The total square footage for each simulation apartment is currently 1,215 square feet for the simulation apartment in Room 630 (including 630A,630B,630C, and 630D) and 1040 square feet for the simulation apartment in Room 640 (including 640A,640B,640C, and 640D).
- D. The following program areas/items have been incorporated in the SD layout for each simulation apartment:
- Two (2) Simulation Equipment Storage Rooms:
 - One AV/IT Room
 - Three (3) De-Briefing Rooms:
 - Four (4) Observation / Control Rooms:
 - o Visual one-way privacy glass to be able to see into the Efficiency space
 - Four (4) Simulated Apartment Efficiency Spaces:
 - o 4 Simulation apartment spaces. 4 bedrooms, 2 restroom, 4 living areas, 4 kitchens, etc.
- E. All the spaces are to be updated with new finishes, layout of power, lighting, HVAC, sprinkler, fire alarm devices, carpeting, etc. to align with current UMB design standards and applicable codes. The existing restrooms and associated plumbing will be removed and replaced with new restrooms that are located close to the existing plumbing connections so the existing plumbing utilities can remain as much as possible. The new layout of de-briefing rooms, control room, and efficiency spaces will likely require a re-configuration of HVAC supply and return, layout of sprinkler heads for appropriate coverage, power receptacles,

lighting fixtures and controls, and potential re-location or installation of new fire alarm devices up to current NFPA standards.

- F. A new central simulation storage room has been created.
- G. This construction renovation work will likely need to be completed in a phased format to limit down time of the simulation apartment spaces. The School of Nursing requires that at no time shall both apartments be unavailable while classes are in session. It is the desire of School of Nursing for at least one of the simulation apartments to be complete and ready for use by September of 2026. This would mean an accelerated design schedule. Design of the project would need to be completed by February order for construction to start on April 1, 2026.

1.3 CONTRACTOR USE OF PREMISES

- A. General: During the construction period the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor's use of the premises is limited only by the University's right to perform work or to retain other contractors on portions of the Project.
- B. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
 - 1. University Occupancy: Allow for University occupancy and use by the public.
 - 2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the University, the University's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of the Existing Building: Maintain the existing building in a weathertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

1.4 OCCUPANCY REQUIREMENTS

- A. Full University Occupancy: The University will occupy the site and existing building during the entire construction period. Cooperate with the University during construction operations to minimize conflicts and facilitate University usage. Perform the Work so as not to interfere with the University's operations.

1.5 PROTECTION OF EXISTING CONSTRUCTION AND FURNISHINGS

- A. The Contractor shall take all necessary precautions to protect the University's property and furnishings. The Contractor shall promptly remedy damage and loss to the University's property caused in whole or in part by the Contractor, a Subcontractor, a Sub-Subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 010100

SECTION 010270 – APPLICATIONS FOR PAYMENT

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. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.
- B. This Section specifies administrative and procedural requirements governing each prime contractor's Applications for Payment.
 - 1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, Submittal Schedule, and List of Subcontracts.

1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
 - a. Contractor's Construction Schedule.
 - b. Application for Payment forms, including Continuation Sheets.
 - c. List of subcontractors.
 - d. Schedule of allowances.
 - e. Schedule of alternates.
 - f. List of products.
 - g. List of principal suppliers and fabricators.
 - h. Schedule of submittals.
 - 2. Submit the Schedule of Values to the University at the earliest possible date but no later than seven (7) days before the date scheduled for submittal of the initial Applications for Payment.
 - 3. Subschedules: Where Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish the format 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. University's Project number.
 - c. Contractor's name and address.
 - d. Date of submittal.
 - 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of Work.

- c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - h. Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100%.
3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Break principal subcontract amounts down into several line items.
4. Round amounts to nearest whole dollar; the total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.
6. Provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Margins of Cost: Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at the Contractor's option.
8. Schedule Updating: Update and resubmit the Schedule of Values prior to the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications for payment as paid for by the University.
 1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.
- B. Refer to the University of Maryland Baltimore Standard General Condition of Construction for requirements and procedures governing applications for payment.
- C. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal of the first Application for Payment, include the following:
 1. List of subcontractors.
 2. List of principal suppliers and fabricators.
 3. Schedule of Values.
 4. Contractor's Construction Schedule.
 5. Schedule of principal products.
 6. Schedule of unit prices.
 7. Submittal Schedule.
 8. List of Contractor's staff assignments.
 9. List of Contractor's principal consultants.
 10. Copies of authorizations and licenses from governing authorities for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction meeting.

13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire the University's insurance.
 16. Initial settlement survey and damage report, if required.
- D. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment.
1. This application shall reflect Certificates of Partial Substantial Completion issued previously for University occupancy of designated portions of the Work.
 2. Administrative actions and submittals that shall precede or coincide with this application include:
 - a. Warranties (guarantees) and maintenance agreements.
 - b. Test/adjust/balance reports.
 - c. Operation and Maintenance Manuals.
 - d. Meter readings if appropriate.
 - e. Startup performance reports.
 - f. Commissioning Reports.
 - g. Final cleaning.
 - h. Application for reduction of retainage and consent of surety.
 - i. Advice on shifting insurance coverages.
 - j. Final progress photographs.
 - k. List of incomplete Work, recognized as exceptions to University's Certificate of Substantial Completion.
- E. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:
1. Completion of Project closeout requirements.
 2. Completion of items specified for completion after Substantial Completion.
 3. Resolve all previously unsettled claims.
 4. Resolve all previously incomplete Work.
 5. Transmittal of required Project construction records to the University.
 6. Proof that taxes, fees, and similar obligations were paid.
 7. Removal of temporary facilities and services.
 8. Removal of surplus materials, rubbish, and similar elements.
 9. Change of door locks to University's access.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 010270

SECTION 010350 – 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. This Section specifies administrative and procedural requirements for handling and processing contract modifications.

1.3 MINOR CHANGES IN THE WORK

- A. The University will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time.

1.4 CHANGE ORDER PROPOSAL REQUESTS

- A. University Initiated Change Order Proposal Requests: The University will issue a detailed description of proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal requests issued by the University are for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.
 - 2. Within a mutually agreed upon time period, submit an estimate of cost necessary to execute the change to the University for review.
 - a. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities. Include required labor hours and unit costs, with totals for each labor category. Include all credits for deleted work.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts, for new work and deleted work.
 - c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
- B. Contractor-Initiated Proposals: When latent or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the University.
 - 1. Include a statement outlining the 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 Contract Time.
 - 2. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities. Include required labor hours and unit costs, with totals for each labor category. Include all credits for deleted work.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts, for new work and deleted work.
 - 4. Comply with requirements in Section "Product Substitutions" if the proposed change requires substitution of one product or system for a product or system specified.

- C. Proposal Request Form: Use forms provided by the Owner for Change Order Proposals. Sample copies are included at the end of this Section.

1.5 CHANGE ORDER PROCEDURES

- A. Upon the University's approval of a Proposal Request, the University will issue a Change Order Requisition for signatures of the Contractor followed by a Notice to Proceed.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 010350

SECTION 010400 – 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. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:
 - 1. General project coordination procedures.
 - 2. Conservation.
 - 3. Coordination Drawings.
 - 4. Administrative and supervisory personnel.
 - 5. Cleaning and protection.

1.3 COORDINATION

- A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to assure required minimum accessibility for maintenance, service, and repair.
 - 3. Make provisions to accommodate items scheduled for later installation.
- B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
 - 1. Prepare similar memoranda for the University and sub-contractors where coordination of their work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of CPM schedules.
 - 2. Installation and removal of temporary facilities.
 - 3. Delivery and processing of submittals.
 - 4. Progress meetings.
 - 5. Work coordination meetings.
 - 6. Project closeout activities.
- D. Conservation: Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare coordination drawings where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components. At a minimum, prepare coordination drawings for all mechanical rooms, electrical rooms and substation rooms.
 1. Show the relationship of components shown on separate Shop Drawings.
 2. Indicate required installation sequences.
 3. Comply with requirements contained in Section "Submittals."
 4. The coordination drawings shall be comprehensive drawings that show all work by all disciplines for each location on a single drawing. The drawings shall be prepared at a large enough scale to permit legibility and ease of recognition of all work.
- B. Staff Names: Within fifteen (15) days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.
 1. Post copies of the list in the Project meeting room, the temporary field office, and at each temporary telephone.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

- A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration until Substantial Completion.
- B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.
- C. 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. 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.
9. Chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining, and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
18. Combustion.
19. Electrical current.
20. High-speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION 010400

SECTION 010450 – CUTTING AND PATCHING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the requirements for cutting and patching.

1.3 SUBMITTALS

- A. Cutting and Patching Proposal: When unforeseen conditions require cutting and patching of the existing structure and/or related components the CM shall submit a cutting and patching proposal to the university, for review and approval before proceeding with any work. Include the following information, as applicable, in the proposal:
 - 1. Describe the extent of cutting and patching required and indicate why it cannot be avoided. Include changes to the building's appearance and other significant visual elements if applicable.
 - 2. Describe the products to be used.
 - 3. Identify the impact to the project's schedule and budget.
 - 4. Indicate the dates when cutting and patching will be performed.
 - 5. Where cutting and patching involves adding reinforcement to structural elements, the modifications to the structure shall be designed by a registered structural engineer. If the design team does not include a structural engineer the CM shall secure the services of an engineer to perform the required design. The CM shall submit the design drawings, details and engineering calculations showing integration of reinforcement with the original structure to the University.
 - 6. Approval by the University to proceed with cutting and patching does not waive the University's right to later require complete removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
 - 1. Obtain hot work permit from the University for cutting, burning, welding, etc. (See attached).
 - 2. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
 - a. Structural concrete.
 - b. Structural decking.
 - c. Miscellaneous structural metals.
 - d. Equipment supports.
 - e. Piping, ductwork, vessels, and equipment.
- B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating

elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal from the University before cutting and patching the following operating elements or safety related systems:
 - a. Primary operational systems and equipment.
 - b. Air or smoke barriers.
 - c. Water, moisture, or vapor barriers.
 - d. Fire protection systems.
 - e. Control systems.
 - f. Communication systems.
 - g. Electrical wiring systems.
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the University's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner when directed by the University.
 1. If possible, retain the original Installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original Installer or fabricator, engage another recognized experienced and specialized firm.
 - a. Acoustical ceilings.
 - b. Carpeting.
- D. Cutting and Patching Responsibilities:
 1. Cutting: cutting shall be the work of the trade requiring the cutting for access, or for permitting the alteration to be performed or an approved subcontractor designated by the trade or the CM.
 - a. Cutting required for inspections shall be the work of the CM/GC.
 - b. Cutting required to obtain test samples of suspected hazardous materials shall be the work of a contractor licensed for the removal of hazardous materials.
 2. Patching: Patching shall be the work of the appropriate trade.
 - a. Maintain the rating of fire rated barriers, using approved sealant products.
 3. Fire Rated Barriers: Where existing fire rated barriers, located in the project area, have unsealed openings for mechanical and electrical work, these openings shall be sealed using the approved sealant products to maintain the fire rating of the barrier.

1.5 WARRANTY

- A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

- A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. For building exterior or visible interior elements, the Architect and the UMB representative

must approve substitutions. Use materials whose installed performance will equal or surpass that of existing materials. Refer to applicable spec sections for materials.

PART 3 – EXECUTION

3.1 CONSTRUCTION WORK – EXCESSIVE NOISE

- A. All construction work that creates excessive noise will not be permitted during normal business hours, 8:00am to 5:00pm (M-F) or 8:00am to 8:00pm (weekends). Work such as core drilling floors, cutting masonry construction or other materials, or inserting hangers in floor slabs shall be scheduled between 5:00am and 8:00am (M-F) or 10:00pm to 8:00am (weekends). Coordinate actual time frames with UMB – Project Manager.

3.2 INSPECTION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.
 - 1. Before proceeding, meet at the Project Site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.3 PREPARATION

- A. Temporary Support: Provide temporary support of work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them or to take them out of service.

3.4 PERFORMANCE

- A. General: Employ skilled workmen or experienced subcontractors to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.
 - 1. In general, when cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required,

- and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
 4. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Ensure all services have been de-energized or drained before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
 2. 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.
 3. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat. Prepare entire surface to receive final coat as necessary for proper adhesion.
 4. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.5 PAINTING

- A. Extent of Painting:
1. Paint over the entire surface plane, unless otherwise noted.
 2. Over patched surfaces paint to the nearest cut off line for the entire surface, such as the intersection with adjacent wall, ceiling, beam, bulkhead, or to the nearest opening frame where a total cut off does not occur within ten (10) feet of the patch, unless otherwise noted.
- B. Appearance and Finish:
1. Appearance: Ensure painted surfaces do not present a spotty, touched-up appearance.
 2. Finish: Provide a smooth continuous surface in texture, coverage and color.

3.6 CLEANING

- A. Areas and spaces where cutting, and patching are performed shall be cleaned. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 010450

SECTION 010950 – REFERENCE STANDARDS AND DEFINITIONS

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 DEFINITIONS

- A. General: Basic contract definitions are included in the Conditions of the Contract.
- B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.
- C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the University, requested by the University, and similar phrases.
- D. "Approved": The term "approved," when used in conjunction with the University's action on the Contractor's submittals, applications, and requests, is limited to the University's duties and responsibilities as stated in the Conditions of the Contract.
- E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": The term "furnish" means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": The term "install" describes operations at the Project Site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.
- I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 - 1. The term "experienced," when used with the term "installer," means having a minimum of five (5) previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of authorities having jurisdiction.
 - 2. Trades: Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
 - 3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are

requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.

- a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.
- J. "Project Site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction, with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.
- K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Format: These Specifications are organized into Divisions and Sections based on CSI's 16-Division format and UMB's Master format numbering system.
- B. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
 1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Streamlined Language: The Specifications generally use the imperative mood and streamlined language. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
 - a. The words "shall be" are implied where a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

- A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.
- C. Conflicting Requirements: Where compliance with two (2) 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 to the University before proceeding for a decision on requirements that are different but apparently equal, and where it is uncertain which requirement is the most stringent.
 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum acceptable. 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 the requirements. Refer uncertainties to the University for a decision before proceeding.

- D. Copies of Standards: Each entity engaged in construction on the Project is required to 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, the Contractor shall obtain copies directly from the publication source.

- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research Co.'s "Encyclopedia of Associations," available in most libraries.

1.5 SUBMITTALS

- A. Permits, Licenses, and Certificates: For the 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 in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 1 – PRODUCTS (Not Applicable)

PART 2 – EXECUTION (Not Applicable)

END OF SECTION 010950

SECTION 012000 – PROJECT MEETINGS

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. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:
 - 1. Preconstruction conferences.
 - 2. Progress meetings.
 - 3. Coordination meetings.

1.3 PRECONSTRUCTION CONFERENCE

- A. The University shall schedule a preconstruction conference before starting construction, at a time convenient to the Contractor and the University, but no later than fifteen (15) days after execution of the Agreement. The conference will be held at a site identified by the University.
 - 1. The GC will conduct the meeting. Minutes will be recorded and distributed to participants in accordance with contract requirements.
- B. Attendees: Authorized representatives of the University, University, and their consultants; the Contractor and its superintendent; major subcontractors; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
- C. Agenda: Discuss items of significance that could affect progress, including, but not limited to, the following:
 - 1. Tentative construction schedule.
 - 2. Critical work sequencing.
 - 3. Designation of responsible personnel.
 - 4. Procedures for processing field decisions and Change Orders.
 - 5. Procedures for processing Applications for Payment.
 - 6. Procedures for processing Requests for Information (RFI's).
 - 7. Procedures for processing University's Supplemental Instructions and Contract Clarification.
 - 8. Distribution of Contract Documents.
 - 9. Submittal of Shop Drawings, Product Data, and Samples.
 - 10. Preparation of record documents.
 - 11. Use of the premises.
 - 12. Parking availability.
 - 13. Office, work, and storage areas.
 - 14. Equipment deliveries and priorities.
 - 15. Safety procedures.
 - 16. First aid.
 - 17. Security.

18. Housekeeping.
19. Working hours.
20. Utility outages.
21. Testing.

1.4 PROGRESS MEETINGS

- A. The University shall schedule and administer bi-weekly progress meetings throughout the progress of work. The progress meetings will be held at a site identified by the University.
 1. The GC will conduct the meeting, record minutes, and distribute copies to participants.
- B. Attendees: In addition to representatives of the University and the University, each subcontractor, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.
 1. Contractor's CPM Construction Schedule: Review progress since the last meeting. Determine status of each activity in relation to the Contractor's Construction Schedule, whether on time, ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time. Determine status of tasks on critical path. Identify additional tasks becoming critical due to delays.
 2. Review the present and future needs of each entity present, including, but not limited to, the following:
 - a. Interface requirements.
 - b. Time.
 - c. Sequences.
 - d. Status of submittals.
 - e. Deliveries.
 - f. Off-site fabrication problems.
 - g. Access.
 - h. Site utilization.
 - i. Temporary facilities and services.
 - j. Hours of work.
 - k. Hazards and risks.
 - l. Housekeeping.
 - m. Quality and work standards.
 - n. Change Orders.
 - o. Documentation of information for payment requests.
 - p. Review submittal log.
 - q. Review RFI log.
 - r. Review Change Order log.
 - s. Review upcoming outages, testing and inspections.
 - t. Conduct RFI & Submittal on board review meetings as necessary.

1.5 COORDINATION MEETINGS

- A. Conduct project coordination meetings at regular intervals convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings.
- B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.
- C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
- D. Review the progress of other construction activities and preparations for the particular activity under consideration at each preinstallation conference, including requirements for the following:
 - 1. Contract Documents.
 - 2. Options.
 - 3. Related Change Orders.
 - 4. Purchases.
 - 5. Deliveries.
 - 6. Shop Drawings, Product Data, and quality-control samples.
 - 7. Review of mockups.
 - 8. Possible conflicts.
 - 9. Compatibility problems.
 - 10. Time schedules.
 - 11. Weather limitations.
 - 12. Manufacturer's recommendations.
 - 13. Warranty requirements.
 - 14. Compatibility of materials.
 - 15. Acceptability of substrates.
 - 16. Temporary facilities.
 - 17. Space and access limitations.
 - 18. Governing regulations.
 - 19. Safety.
 - 20. Inspecting and testing requirements.
 - 21. Required performance results.
 - 22. Recording requirements.
 - 23. Protection.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 012000

SECTION 013000 – 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. This Section includes administrative and procedural requirements for submittals by the Contractor as required by the contract documents.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals." Informational Submittals will be acknowledged.
- C. Closeout Submittals: Written and graphic information regarding the operations and maintenance of a product or system, and that do not require Architect's responsive action. Closeout submittals are those submittals indicated in individual Specification Sections as "closeout submittals." Closeout Submittal will be acknowledged.
- D. Shop Drawings, Product Data and Samples: Instruments prepared and submitted by Contractor, for Contractor's benefit, to communicate to Architect the Contractor's understanding of the design intent, for review and comment by Architect on the conformance of the submitted information to the general intent of the design. Shop drawings, product data and samples are not Contract documents. Drawings, diagrams, schedules and illustrations, with related notes, are specially prepared for the Work of the Contract, to illustrate a portion of the Work.
- E. Product Data: Standard published information ("catalog cut sheets") and specially prepared data for the Work of the Contract, including standard illustrations, schedules, brochures, diagrams, performance charts, instructions and other information to illustrate a portion of the work.
- F. Samples: Physical examples that demonstrate the materials, finishes, features, workmanship or other characteristics of a portion of the Work. Accepted samples shall service as quality basis for evaluation the Work.

- G. Other Submittals: Technical data, test reports, calculations, surveys, certifications, special warranties and guarantees, operation and maintenance data, extra stock and other submitted information and products shall also not be considered Contract Documents but shall be information from Contractor to Architect to illustrate a portion of the Work for confirmation of understanding the design intent.
- H. e-Builder: The University employs the e-Builder Construction Project Management System. The software enables members to manage work via a web based graphical interface. Owner will establish project specific page on e-Builder with project specific members. The site login address is <https://app.e-builder.net/>.
- I. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.
- J. XLS: A file format created by Microsoft for use with Microsoft Excel which is a spreadsheet program that presents table of values arranged in rows and columns.

1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Contractor shall prepare and submit a Submittal Schedule which lists submittal items per the product specifications for review and approval by the Architect. Contractor shall allow seven (7) days for Architect and University review. The Submittal Schedule shall identify all specified submittals to be made and shall serve as a checklist for submittals. Arrange the submittals in numerical order by specification section. 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 and additional time for handling and reviewing submittals required by those corrections.
 - 1. Use the Preliminary Project Submittal Register (when provided by the Architect) as a basis for submittals required to be submitted, including requirements for concurrent submittals, and complex submittals which may require additional review time by the Architect at Initial Review.
 - 2. Coordinate Submittal Schedule with list of subcontracts, the Schedule of Values, and Contractor's construction schedule.
 - 3. Format: Submit the Submittal Schedule as a Microsoft Excel file. Use the University-provided excel template which can be found in the eBuilder submittal folder.
 - 4. The first submittal shall be the Submittal Schedule.
 - 5. Review of any submittal without submission and approval of submittal schedule does not relieve Contractor of responsibility to provide Submittal Schedule for approval.
 - 6. Contractor shall review Submittal Register and supplement as required to provide complete Submittal Schedule for review and approval.
 - 7. Contractor shall revise Submittal Schedule as required to include addition or deletion of submittals during project duration.

1.5 SUBMITTAL FORMATS

- A. Action Submittals: Assemble all Action Submittals for each specification section into a single Submittal Package for submission into e-builder unless otherwise specified or agreed to during the Submittal Schedule review. Failure of Contractor to assemble all Action Submittals in single package may result in Architect withholding action on submittal(s) until associated submittal(s) required by applicable specification section are received.
1. Product Data can be submitted as a separate Submittal Item before or concurrent with Shop Drawings and before or concurrent with Samples unless otherwise noted in individual specification sections. Product data, shop drawings, color charts and/or samples can be submitted as a single submittal where appropriate.
 2. Each Action Submittal shall clearly indicate the products that will be provided by the contractor, including indicating selected options when specified. Where published data sheets are provided which indicate the availability of multiple products or multiple options/selections for products, clearly mark the submittal using arrows, clouds, boxes, or highlighting to indicate intended options and selections for each product.
 3. Action submittals shall not include manufacturer's warranty and/or operation and maintenance instructions. This information shall be included in the project's operation and maintenance manual submittal.
- B. Informational and Closeout Submittals: Submit Informational and Closeout Submittals in separate Submittal Package as applicable rather than in single Action Submittal package described above.
- C. Processing Submittals: Submittals shall be processed electronically using e-Builder. Transmit all submittals from Contractor to Architect via e-Builder, unless otherwise directed. Submittals received from sources other than the Contractor will be returned without action. Include all information specified below for identification of submittals.

1.6 SUBMITTAL IDENTIFICATION FORM

- A. Submit each Submittal Item with a Submittal Identification Form, in a format developed with the Architect and acceptable to the University, including the following information for each submittal:
1. Project name and University project number.
 2. Submission date.
 3. Name and address of Architect.
 4. Name and address of Contractor.
 5. Name of firm or entity that prepared submittal.
 6. Names of subcontractor, manufacturer, and supplier as applicable.
 7. Category (action or informational).
 8. Include the following information identical to that listed in the approved Submittal Schedule.

- a. Specification section.
 - b. Unique submittal title, including revision identifier.
 - 1) As an option, when a submittal item includes multiple types of submittals (Product Data, Shop Drawings, Qualifications, etc.) include an abbreviation of each that identifies the types.
 - c. Type of submittal (product data, test report, etc.).
 - 1) Only one type of submittal may be selected in the drop down category, for multiple types of items in one submittal choose the category that is the most explanatory.
9. Place for Contractor submittal approval certification, including name, date and signature.
10. Identifiable location for Architect's Action stamp and/or comments.
11. Identifiable location for University's Review stamp and/or comments.
12. Other necessary identification.
13. Submittals not including a Submittal Identification Form will be returned as "Not Reviewed".
- B. Identify each element in a Submittal Item by a unique identifier such as: reference to the Specifications article and paragraph, bullet, Drawing sheet number, detail, schedule, room number, assembly or equipment number, and or any other pertinent information that can be used to clearly correlate submittal with Contract Drawings.
- C. On the Submittal Identification Form, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information submitted complies with requirement of the Contract Documents.
- D. Input each Submittal Item using the eBuilder Submittal Module with identical information as found on the approved Submittal Schedule.
- E. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. For full version specifications Name PDF file with the UMB specification section number and title. For condensed specifications Name PDF file with the UMB division number, article number and title. Submittal file names shall be identical to that found in the approved Submittal Schedule. Provide revision number where applicable. See examples below:
- 1. File Name Examples:
 - a. Full Version Specification: 087100 Door Hardware
 - b. Full Version Specification: 230523 Valves for HVAC Piping Systems
 - c. Condensed Specification: 22 - 2.6 Plumbing Valves
 - d. Condensed Specification: 23 - 2.2 HVAC Valves R1

2. Contractor's file names shall not be altered by the A/E and UMB except adding the A/E and UMB Initials (XXX) at each review step. See examples below:

- a. Full Version Specification: 087100 Door Hardware XXX.pdf
- b. Full Version Specification: 087100 Door Hardware XXX.pdf
- c. Condensed Specification: 22 - 2.6 Plumbing Valves XXX.pdf
- d. Condensed Specification: 23 - 2.2 HVAC Valves XXX.pdf

- F. Options: When the specification does not identify a manufacturer's specific feature, such as color, provide options available for selection by the Architect.

1.7 SUBMITTAL PROCEDURES

- A. Prepare and submit types of submittals with submittal items as required by individual Specification Sections. Examples of types of submittals include product data, shop drawings, color charts and/or samples. Each submittal shall be one e-Builder item, unless submittal types are grouped together for review. Multiple files can be uploaded to eBuilder under a single submittal item when the submittal types are packaged together.
- B. Submittal Item: Each submittal Item shall be provided with a Submittal Identification Form addressed from the Contractor to the Architect.
- C. Use the eBuilder Submittal Module to create each Submittal Item. Persons entering submittals shall be trained by UMB on the eBuilder Submittal Module prior to entering the Submittal Schedule and any other submittals. Upload the pdf of the submittal directly to the e-Builder Submittal Module.
- D. Submittal File Name, Contents and Bookmarks:

1. File Name: UMB Specification # - Title (R1, R2 etc.):

- a. Example - Full Specification:
 - 1) 220523 – Valves for Plumbing Piping System
- b. Example - Condensed Specification:
 - 1) 2.6 – Plumbing Valves

2. Submittal Contents and Bookmarks:

- a. Contents: Include submittal data corresponding to each article in the specification section in the submittal file name.
- b. Bookmarks: Include bookmarks for files larger than 15 pages for each product in the submittal file. Label each product bookmark with the UMB Article # and Title. See examples below and sample bookmarks in Part 3:

- 1) Example: 2.2 Shut Off Valves
 - 2) Example: 2.4 Check Valves
 - 3) Example: 2.5 Special Valves
 - 4) Hyperlinks to documents on the web are not allowed and are not acceptable as a substitution for product data. A submittal must be complete without any external links.
- c. Submitted file shall be a searchable PDF electronic file.
- d. When a Submittal includes multiple submittals from a single spec section, it shall be described properly in the submittal file name. Use the following abbreviations, PD – Product Data, SD – Shop Drawings, QUAL – Qualification Data, etc. see examples below:
- 1) Example: 123600 Wood Laboratory Furniture PD, SD, QUAL
 - 2) Example: 123661 Simulated Stone Countertops PD, QUAL
- E. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate submittal items.
 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.
Certain submittals need to be reviewed concurrently, including but not limited to, the following:
 - 1) 087100 Door Hardware with 281300 Access Control System
 - 2) 090000 Wall and floor finishes for coordination of colors.
- b. Submittals that require selection of colors will be reviewed. Color selection may not be provided until all submittals requiring color selection have been received and reviewed, and color selections have been approved by the Architect.
- c. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- F. Submittal Comments: Submittal comments entered on the submittal by the Supplier, CM / Contractor, Consultant (A/E), and UMB Personnel shall follow the assigned color codes, based on using Bluebeam Colors, as follows:

1. Supplier, CM / Contractor: Use color Dark Green
 2. Consultant (A/E): Use color Red
 3. UMB: Use color Light Cyan Blue
- G. Processing Time: Allow time for submittal review, including time for resubmittals, as follows: Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the work to permit processing, including resubmittals.
1. Initial Review: Allow 15 working days for initial review of each submittal (which includes University's review) unless otherwise noted on the approved Submittal Schedule. Allow additional time if coordination with concurrent submittals is required. The Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Initial Review of Concurrent Submittals: Allow additional time if coordination with concurrent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 3. Initial Review of Complex Submittals: At the time of review and approval of the Submittal Schedule, the Architect will advise Contractor of certain submittals that are substantially complicated or require multiple reviewers and need an extended initial review time, including but not limited to, the following:
 - a. 081113 Hollow Metal Doors and Frames (21 days)
 - b. 087100 Door Hardware (21 days).
 - c. 210000 Fire Protection Submittal (45 days) includes Fire Marshal review.
 - d. 283111 Digital Addressable Fire-Alarm System (45 days) includes Fire Marshal review.
 4. Resubmittal Review: Allow 15 days for review of each resubmittal.
- H. Resubmittals: Make resubmittals in same form as initial submittal.
1. Note date and content of previous submittal only (do not include entire rejected submittal).
 2. Note date and content of revision in Submittal Identification Form and clearly indicate extent of revision. Provide responses to Architect's review comments as appropriate to address concerns raised. Annotate the product data sheets, shop drawings, calculations, etc. to clearly indicate compliance with the original specification requirements and to demonstrate compliance with review comments.
 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- I. Delegated Design Services Certification: In addition to other required submittals, submit digitally-signed PDF electronic file paper copies of certificate, signed and sealed by the responsible design professional.

- 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.
- K. Use for Construction: Establish and maintain access to eBuilder so that all submittals are available for use on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.8 CONTRACTOR'S REVIEW OF SUBMITTALS

- A. Contractor's Review of Submittals: Prior to submission to Architect for review, Contractor shall collect complete submittal documentation from the Sub/Manufacturer, create the Submittal Package, and assign Submittal Items to it. Each Submittal Item shall be reviewed by the Contractor.
 - 1. Upon receipt of a submittal from the vendor the contractor shall be responsible for reviewing and verifying the submittal is complete and complies with all the requirements of the construction documents before forwarding the submittal to the CM/GC. If the submittal does not comply, the contractor shall identify the deficiencies and promptly return the submittal to the vendor for correction. If the incomplete or incorrect submittal is forwarded on by the CM/GC to the A/E and/or UMB, the CM/GC or contractor shall be responsible for any cost issues resulting from re-processing the submittals.
- B. The Contractor shall create one Submittal Identification Form for each Submittal Item. The Contractor shall certify that submittals have been reviewed and approved. Note corrections and field dimensions. Mark each Submittal Item with a uniform approval stamp including the name of the reviewer and the date of the Contractor's approval and sign each Submittal Item. Submittals without stamp and signature will not be reviewed and will be returned. Electronic signatures are acceptable. Contractor's submittal approval shall certify the following actions by Contractor:
 - 1. Field measurements have been determined and verified.
 - 2. Conformance with requirements of Contract Drawings and Specification is confirmed.
 - 3. Catalog numbers and similar data are correct and indicated with arrow or highlighting; items not used, but on same page shall be crossed out.
 - 4. Work being performed by various subcontractors and trades is coordinated.
 - 5. Field construction criteria have been verified, including confirmation that information submitted has been coordinated with the work being performed by others for the University and actual site conditions.
 - 6. All deviations from requirements of Drawings and Specifications have been identified and noted.
 - 7. Submittals not certified by being stamped and signed by Contractor electronically on the Submittal Identification Form will be returned without action, as will submittals which, in the Architect's opinion, have not been adequately reviewed and coordinated by Contractor.

- C. Changes in Work: Changes in the Work shall not be authorized by submittal review actions. No review action, implicit or explicit, shall be interpreted to authorize changes in the Work. Changes shall only be authorized by separate written direction from the University, in accordance with the Contract General Conditions. However, to minimize the ordering of incorrect equipment/parts, notes may indicate forthcoming changes via CDC.

1.9 REVIEW OF SUBMITTALS BY ARCHITECT AND UNIVERSITY

- A. Review of Submittals by Architect and University: Submittals shall be a communication aid between Contractor and Architect by which interpretation of Contract Documents requirements may be confirmed in advance of construction.
 - 1. Reviews by University, Architect and Architect's consultants shall be only for general conformance with the design concept of the Project and general compliance with the information given in the Drawings and Specifications.
 - 2. The Architect's review shall not be construed as an "approval," or to relieve the Contractor(s) and material suppliers of responsibility for errors or omissions in the submitted documents.
 - 3. Acceptance of a specific item does not include acceptance of the assembly of which the item is a component.
 - 4. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly via the web-based software (e-Builder) system.
- B. Architect's Review Action: Architect will mark each submittal with a uniform, self-explanatory action. Architect's action may be a stamp on the Contractor's Submittal Identification Form or a separate review sheet on Architect's standard form.
 - 1. Submittal will be appropriately marked as follows to indicate the action taken:
 - a. Action 1 APP (no exceptions taken) Means fabrication, manufacture, or construction may proceed providing submittal complies with Contract Documents.
 - 1) Equivalent to Architect's stamp Action: APPROVED
 - b. Action 2a AAN (note markings; no resubmission required): Means fabrication, manufacture, or construction may proceed providing submittal complies with Architect's notations and Contract Documents. (Note: If Contractor cannot comply with notations, make revisions and resubmit.)
 - 1) Equivalent to Architect's stamp Action: APPROVED AS NOTED
 - c. Action 2b RFR (note markings/resubmit for record): Means fabrication, manufacture, or construction may proceed; however, submittal did not fully demonstrate full extent of all conditions, details and coordination with other

surrounding work and therefore requires additional information and rework as noted. Resubmit shop drawings for final Action 1 or 2. Should Contractor proceed with fabrication, manufacturing or construction, it shall do so at its own risk.

1) Equivalent to Architect's stamp Action: APPROVED AS NOTED
PROVIDE RECORD COPY

d. Action 3 A&R (amend and resubmit): This is the equivalent to R&R (revise and resubmit). Means submittal does not comply with design intent of Contract Documents. Do not use submittals stamped Action 4. Make revisions and resubmit.

1) Equivalent to Architect's stamp Action: CORRECT AND
RESUBMIT

e. Action 4 REJ (rejected, submit specified item or resubmit with related assembly items): Means submittal varies from specified item or system specified in Contract Documents and is not acceptable for use on the project. Do not use submittals stamped Action 5. Make revisions and resubmit.

1) Equivalent to Architect's stamp Action: DISAPPROVED AS
NOTED

f. Action 6 NAR (no action required): Means documents have not been reviewed by Architect and submittal is returned to Contractor for several possible reasons: submittal not requested, submittal not complete, Submittal Transmittal form is not included, submittal not coordinated, or submittal bears no resemblance to design intent.

1) Equivalent to Architect's stamp Action: NO ACTION TAKEN

2. Do not permit submittals marked "Rejected or Revise and Resubmit" to be used at the Project site, or elsewhere where Work is in progress.

3. Any work performed prior to receiving a fully approved submittal shall be done at the Contractor's risk and shall be subject to being replaced if Contract requirements are not met.

C. University Review: The University will review the submittal, stamp, and upload the stamped submittal to e-Builder.

D. Final Review Action: The Architect will provide final Action for the submittal and return stamped submittal to the Contractor.

E. Contractor Action: The Contractor will be notified through eBuilder that the submittal is ready for his action. The Contractor shall incorporate all review comments and resubmit if so indicated by the eBuilder and Architect's actions and markings.

F. Contract Requirements:

1. Review actions by Architect and Architect's consultants or the University shall not relieve the Contractor from compliance with requirements of the Contract Drawings and Specifications.
2. Acceptance of submittals with deviations shall not relieve Contractor from responsibility for additional costs of changes required to accommodate such deviations.
3. Deviations included in submittals without prior acceptance will be considered an exception from review of submittals whether noted or not on returned copy.
4. No review action, implicit or explicit, shall be interpreted to authorize changes in the Work. Changes shall only be authorized by separate written Change Order or Field Instruction, in accordance with the Contract General Conditions.
5. When professional certification of performance criteria of materials, systems or equipment is required by Contract Documents, the Architect shall be entitled to rely upon accuracy and completeness of such calculations and certifications.

G. Resubmittals: Subject to same terms and conditions as original submittal.

1. The University will not accept excessive resubmittals.
2. Should excessive resubmittals be required, Contractor may be subject to reimburse the University for Architect's accounts for time spent in processing additional resubmittals at their contractual hourly rate.

1.10 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment included in the specification section.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, generate specific shop drawings for the submittal, and title the submittal as product data.
2. Mark each submittal to show which products and options are applicable. Clearly indicate all aspects of the proposed items, including material selections and all options specified. Failure to indicate such details could result in the submittal being returned as incomplete.
3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency, including credentials.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
- B. Shop Drawings: Prepare and submit Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
 1. Preparation: Fully illustrate requirements as shown in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. e-Builder: Submit one PDF copy of each submittal, with any scaled drawings capable of being printed as a full-size drawing.
- C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Sample Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 3. Transmittal: Provide Submittal Identification Form and include complete submittal information indicated. Include photographic image(s) illustrating Sample characteristics, and Sample Identification information for record.
 4. e-Builder: Prepare transmittal in PDF form, and upload to e-Builder. Enter required data in e-Builder to fully identify submittal.

5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit two full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one set with options selected.
7. 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 two sets of Samples. Architect will retain one Sample set; remainder will be returned. 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.
- D. Product Schedule (when required or applicable): As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.

3. Number and name of room or space.
 4. Location within room or space.
- E. Qualification Data: Prepare and submit 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.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
1. Certificates and Certifications Submittals: Submit 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. Provide a notarized signature where indicated.
 2. 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.
 3. 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.
 4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
 5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
 6. 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.
- H. Test and Research Reports:
1. 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.
 2. 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.
 3. Material Test Reports: Submit reports written by a qualified testing agency, on testing with requirements in the Contract Documents.

4. 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.
5. 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.
6. 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:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.
7. Corrective Action Report: Testing agency shall submit written documentation of any defects found and any corrective action taken, or proposed solutions.

1.11 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 insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. BIM Incorporation: Incorporate delegated-design drawing and data files into BIM established for Project.
 1. Prepare delegated-design drawings in the same digital data software program, version, and operating system as original Drawings

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

Submittal Bookmark Example: The following bookmark example is based on using an outline type arrangement with each line linked to the appropriate submittal page:

UMB Submittal Stamp

CM/Contractor Transmittal

CM/Contractor Replies (Resubmittal Only)

Consultant's Comments

Manufacturer's Transmittal

Manufacturer's Replies (Resubmittal Only)

Product Data

Product A (Example for A: 2.2 Shut Off Valves)

Product B (Example for B: 2.4 Check Valves)

Product C (Example for C: 2.5 Special Valves)

Fabrication Drawings

Drawing 1

Drawing 2

Drawing 3

Maintenance Data (Leave blank for submittal)

Manufacturer's Maintenance Data [Include data in approved submittal for project manual]

END OF SECTION 013000

SECTION 013110 – SCHEDULES AND REPORTS

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. This Section includes administrative and procedural requirements for schedules, reports, and critical path method scheduling required for proper performance of the Work, including:
 - 1. Submittal schedule.
 - 2. Schedule of inspections and tests.
 - 3. Daily construction reports.
 - 4. Material location reports.
 - 5. Field correction reports.
 - 6. Special reports.

1.3 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of schedules and reports with performance of other construction activities.

1.4 DEFINITIONS

- A. Critical Path Method (CPM): A method of planning and scheduling a construction project where activities are arranged based on activity relationships and network calculations determine when activities can be performed and the critical path of the Project.
- B. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall project duration.
- C. Network Diagram: A graphic diagram of a network schedule, showing the activities and activity relationships.
- D. 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 activities are activities on the critical path.
 - 2. Predecessor activity is an activity that must be completed before a given activity can be started.

- E. Event: An event is the starting or ending point of an activity.
- F. Milestone: A key or critical point in time for reference or measurement.
- G. Float is the measure of leeway in activity performance. Accumulative float time belongs to the University.
 - 1. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
 - 2. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned project completion date.

1.5 QUALITY ASSURANCE

- A. The Contractor's Consultant: Retain a consultant to provide planning, evaluating, and reporting by CPM scheduling.
- B. The Consultant shall be a recognized specialist, acceptable to the University, who is an expert in CPM scheduling and reporting.
- C. The Consultant shall have computer facilities that are capable of delivering detailed network diagrams within forty eight (48) hours of request.
- D. In-House Option: The University may waive the requirement to retain a consultant if the Contractor can demonstrate that:
 - 1. The Contractor has the computer equipment required to produce CPM network diagrams.
 - 2. The Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques.
- E. Program: Use a computer software program for network analysis that has been developed specifically to manage CPM construction schedules and is acceptable to the University.
- F. Standards: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

1.6 RELIMINARY NETWORK DIAGRAM

- A. Preliminary Network Diagram: Submit a preliminary network diagram within fourteen (14) days of the Notice to Proceed. The preliminary network diagram shall outline activities for the first sixty (60) days of construction. Include a skeleton diagram for the remainder of the Work with the preliminary diagram.

1. Include each significant construction activity. Coordinate each activity in the network with other activities. Schedule each construction activity in proper sequence.
 2. Indicate completion of the Work on the date established for Substantial Completion, unless the University agrees otherwise.
- B. Cash Requirement Prediction: With submittal of the preliminary network diagram, include a preliminary cash requirement prediction based on indicated activities.
- C. Distribution: Distribute the preliminary network diagram to parties involved in construction activities that are scheduled early, including the University and the University.

1.7 CPM SCHEDULE

- A. Prepare the Contractor's Construction Schedule using the network analysis diagram system known as the critical path method (CPM). Follow procedures outlined in AGC's "Construction Planning & Scheduling."
1. Proceed with preparation of the network diagram immediately following Notice to Proceed.
 2. Follow the steps necessary to complete development of the network diagram in sufficient time to submit the CPM Schedule so it can be accepted for use no later than sixty (60) days after commencement of the Work.
 3. Conduct educational workshops to train and inform key project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 4. Establish procedures for monitoring and updating the CPM Schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates. Use "one working day" as the unit of time.
- B. CPM Schedule Preparation: Prepare a list of all activities involved in the Project. Include a list of activities required to complete the Work. No single activity shall exceed fifteen (15) work days. Provide the best data available for generation of the network diagram and the CPM Schedule.
1. Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities.
 2. Indicate estimated times for the following activities to be performed:
 - a. Preparation and processing of submittals.
 - b. Purchase of materials.
 - c. Delivery.
 - d. Fabrication.
 - e. Installation.
 3. Treat each story or separate area as a separate numbered activity for principal elements of the Work.

4. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
- C. Processing: Enter prepared data on the processing system. Process data to produce output data or 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 Contract Time.
- D. Format: Display the full network on a single sheet of stable transparency, or other reproducible media, of sufficient width to show data clearly for the entire construction period.
1. Mark the critical path. Locate the critical path near the center of the network; locate paths with the most float near the edges.
 2. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Initial Issue: Prepare the initial issue of the CPM Schedule network diagram from a listing of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports to show the following:
1. The Contractor or subcontractor and Work or activity.
 2. Description of the activity.
 3. Principal events of that activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in working days (maximum limit is fifteen (15) work days for construction activity).
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the Schedule of Values).
- F. Value Summaries: Prepare two (2) cumulative value listings, sorted by finish dates.
1. In first listing, tabulate the following:
 - a. Activity number.
 - b. Early finish date.
 - c. Dollar value.
 - d. Cumulative dollar value.
 2. In second listing, tabulate the following:
 - a. Activity number.
 - b. Late finish date.
 - c. Dollar value.
 - d. Cumulative value.

3. In subsequent issues of both listings, substitute actual finish dates for activities completed as of listing date.
4. Prepare listing for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary listings, tabulate "actual percent complete," and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts following each regularly scheduled progress meeting.

1.8 CPM SUBMITTALS

- A. Submittal and Distribution: Submit three (3) copies of the initial issue of the tabulations and network to the University for acceptance. When authorized, distribute copies to the separate contractors, subcontractors and suppliers or fabricators, and others identified by the Contractor with a need-to-know schedule responsibility.
 1. Post copies in the 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.
 3. Submit copies of each computer-produced report to the University.
- B. Schedule Updating: Revise the schedule immediately after each meeting or other activity, where revisions have been recognized or made. Issue the updated schedule at each project meeting and submit with application for payment. Requests for payment will not be made without an updated CPM schedule.

1.9 SUBMITTAL SCHEDULE

- A. After development and acceptance of the Contractor's CPM Schedule, prepare a complete schedule of submittals. Submit the schedule within ten (10) days of the date required for submittal of the Contractor's CPM Schedule.
 1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values and the list of products as well as the Contractor's Construction Schedule.
- B. Prepare the schedule in chronological order. Provide the following information:
 1. Scheduled date for the first submittal.
 2. Related Section number.
 3. Submittal category.
 4. Name of the subcontractor.
 5. Description of the part of the Work covered.
 6. Latest scheduled date for the University's review/approval.

- C. Distribution: Upon final approval of the University, print and distribute copies to the University, University, subcontractors, and other parties required to comply with submittal dates indicated.
 - 1. Post copies in the Project meeting room and temporary field office.
 - 2. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned part of the Work and are no longer involved in construction activities.
- D. Schedule Updating: Revise the schedule after each meeting or other activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.10 SCHEDULE OF INSPECTIONS AND TESTS

- A. Prepare a schedule of inspections, tests, and similar services required by the Contract Documents. Submit the schedule within thirty (30) days of the date established for commencement of the Work.
- B. Form: The schedule shall be in tabular form and shall include, but not be limited to, the following:
 - 1. Specification Section number.
 - 2. Description of the test.
 - 3. Identification of applicable standards.
 - 4. Identification of test methods.
 - 5. Number of tests required.
 - 6. Time schedule or time span for tests.
 - 7. Entity responsible for performing tests.
 - 8. Requirements for taking samples.
 - 9. Unique characteristics of each service.
- C. Distribution: Distribute the schedule to the University, and each party involved in performance of portions of the Work where inspections and tests are required.
- D. Schedule Updating: Revise the schedule after each meeting or other activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.11 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at the site. Submit duplicate copies to the University at weekly intervals:

1. List of subcontractors at the site.
2. List of separate contractors at the site.
3. Approximate count of personnel at the site.
4. High and low temperatures, general weather conditions.
5. Accidents.
6. Meetings and significant decisions.
7. Unusual events (refer to special reports).
8. Stoppages, delays, shortages, and losses.
9. Meter readings and similar recordings.
10. Emergency procedures.
11. Orders and requests of governing authorities.
12. Change Orders received, implemented.
13. Services connected, disconnected.
14. Equipment or system tests and startups.
15. Partial Completions, occupancies.
16. Substantial Completions authorized.

- B. Material Location Reports: At weekly intervals, prepare a comprehensive list of materials delivered to and stored at the site. The list shall be cumulative, showing materials previously reported plus items recently delivered. Include with the list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from the site. Submit copies of the list to the University at weekly intervals.

1.12 SPECIAL REPORTS

- A. General: Submit special reports directly to the University within one day of an occurrence. Submit a copy to other parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at the site, prepare and submit a special report. List the chain of events, persons participating, and responses by the Contractor's personnel, an evaluation of the results or effects and similar pertinent information. Advise the University in advance when such events are anticipated or predictable.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 013110

SECTION 013800 – CONSTRUCTION PHOTOGRAPHS

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. This Section includes administrative and procedural requirements for construction photographs for the following types of projects:

- 1. Campus renovation projects.

1.3 CM REQUIREMENTS

- A. The CM shall make arrangements to have a series of construction photographs taken of the construction site utilizing their personnel with a digital camera.
- B. The CM shall maintain an up-to-date electronic file of the photographs in numerical order per month in an XL spread sheet format as follows:

- 1. The XL spread sheet shall include a header with the UM Project Name and Project Number. Under the header include columns for “Photo #”, “Date” “Location on Project Site”, “View of the Photo” “Description” and “Photograph”. For Example:
 - a. Photo #1
 - b. 6-5-12
 - c. Observation Room
 - d. Looking East
 - e. One-Way Vision Mirror Glass
 - f. Photograph

1.4 SUBMITTALS

- A. Monthly: Submit construction photographs, electronically, in “pdf” file format to the University Project Manager (PM) monthly with the application for payment.
 - 1. Organize the electronic “pdf” files as indicated in paragraph 1.3 above.
 - 2. Pre-construction photographs shall be submitted with the first application for payment.

1.5 PHOTOGRAPHIC REQUIREMENTS

- A. The CM shall take a series of construction photographs to document conditions at the project site and during various stages of construction as follows:
1. Pre-Construction Photographs: Prior to the start of construction take photographs of the project site and adjacent areas as follows:
 - a. Campus Renovation Projects: Take photographs in sufficient number to show existing conditions adjacent to the work areas, to indicate pre construction damage to existing walls, partitions, insulation, previous work that was not completed, and/or missing materials before starting work.
 2. Construction Progress Photographs:
 - a. Take project photographs, in accordance with requirements indicated, to best show the status of construction and progress since taking previous photographs.
 - b. Frequency: Take photographs monthly, coinciding with the cutoff date associated with each Application for Payment.
 - c. Vantage Points: Comply with the University's directions concerning desired vantage points for shots.
 3. Record Photograph Files:
 - a. At the end of the project submit a complete set of record photographs, organized in XL spread sheets on a CD-R in a full size jewel case to the University. Label the CD-R and the jewel case with the UMB Project Title, UMB Project Number, contents on the CD, and the submission date.
 4. Post Construction Photographs:
 - a. After the project has completed if the A/E, the CM, and/or other contractors would like to have a series of post construction photographs taken of the project site they must submit a written request to the University PM. The PM will contact the contact the appropriate University representatives to gain approval and the set up a time for the photographs to be taken. Post construction photographs will not be allowed without the approval of the end user or their representative.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 013800

SECTION 014000 – QUALITY CONTROL

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. This Section includes administrative and procedural requirements for quality-control services.
- B. Quality-control services include inspections, tests, and related actions, including reports, performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by the University.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

1.3 RESPONSIBILITIES

- A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services are included in the Contract Sum.
 - 1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor may perform testing by its own workforce. The Contractor shall employ and pay a qualified independent testing agency to perform quality-control services for the following list of testing requirements: Costs for these services are included in the Contract Sum.
 - 2. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the University's responsibility, the University will employ and pay a qualified independent testing agency to perform those services.
- B. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.

1. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.
- C. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
1. Provide access to the Work.
 2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
 3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
 4. Provide facilities for storage and curing of test samples.
 5. Deliver samples to testing laboratories.
 6. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
 7. Provide security and protection of samples and test equipment at the Project Site.
- D. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the University and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
1. The agency shall notify the University and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
 3. The agency shall not perform any duties of the Contractor.
- E. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.4 SUBMITTALS

- A. Unless the Contractor is responsible for this service, the independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the University. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
 - a. Date of issue of report.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making the inspection or test.
 - f. Designation of the Work and test method.
 - g. Identification of product and Specification Section.
 - h. Complete inspection or test data.
 - i. Test results and an interpretation of test results.
 - j. Ambient conditions at the time of sample taking and testing.
 - k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
 - l. Name and signature of laboratory inspector.
 - m. Recommendations on retesting.

1.5 QUALITY ASSURANCE

- A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.
 1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

- C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 014000

SECTION 015000 – CONSTRUCTION FACILITIES AND TEMPORARY 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. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection.
- B. Temporary utilities include, but are not limited to, the following:
 - 1. Temporary electric power and light.
 - 2. Temporary heat.
 - 3. Ventilation.
- C. Support facilities include, but are not limited to, the following:
 - 1. Field offices and storage sheds.
 - 2. Temporary project identification signs and bulletin boards.
 - 3. Waste disposal services.
 - 4. Construction aids and miscellaneous services and facilities.

1.3 SUBMITTALS

- A. Temporary Utilities: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.
- B. Implementation and Termination Schedule: Within fifteen (15) days of the date established for commencement of the Work, submit a schedule indicating implementation and termination of each temporary utility.

1.4 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
 - 1. Building code requirements.
 - 2. Health and safety regulations.
 - 3. Utility company regulations.
 - 4. Police, fire department, and rescue squad rules.

5. Environmental protection regulations.

- B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."

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

1.5 PROJECT CONDITIONS

- A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the University, change over from use of temporary service to use of permanent service.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. If acceptable to the University, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.
- B. Lumber and Plywood:
1. For job-built temporary offices, shops, and sheds within the construction area, provide UL-labeled, fire-treated lumber and plywood for framing, sheathing, and siding.
2. For signs and directory boards, provide exterior-type, Grade B-B high-density concrete form overlay plywood of sizes and thicknesses indicated.
- C. Gypsum Wallboard: Provide gypsum wallboard on interior walls of temporary offices.

2.2 EQUIPMENT

- A. General: Provide new equipment. If acceptable to the University, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
- B. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
- C. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
- D. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.
- E. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.
- F. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.
- G. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 – EXECUTION

3.1 INSTALLATION

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

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Coordinate with the University Operations and Maintenance Personnel to install temporary service or connect to existing service. Provide all necessary labor, materials and equipment for connections.
1. Coordinate with the University for a time when service can be interrupted, if necessary, to make connections for temporary services.
 2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
 3. Obtain easements to bring temporary utilities to the site where the University's easements cannot be used for that purpose.
 4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the University. The University will not accept cost or use charges as a basis of claims for Change Orders.
- B. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.
1. Install electric power service underground, except where overhead service must be used.
 2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, ac 20 Ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
- C. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching.
1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
- D. Temporary Heat: Provide temporary heat required by construction activities for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
- E. Heating Facilities: Except where the University authorizes use of the permanent system, provide vented, self-contained, LP-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open flame, or salamander heating units is prohibited.

3.3 SUPPORT FACILITIES INSTALLATION

- A. Locate field offices, storage sheds, and other temporary construction and support facilities for easy access.
 1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the University.
- B. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.
 1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated.
 2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.
- C. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than seven (7) days during normal weather or three (3) days when the temperature is expected to rise above 80°F (27°C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the University.

- B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."
1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell. Store combustible materials in containers in fire-safe locations.
 2. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Smoking is not permitted anywhere on project sites.
 3. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- C. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
- D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against.
- E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
1. 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.
- F. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a twenty four (24) hour basis where required to achieve indicated results and to avoid possibility of damage.
 2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Termination and Removal: Unless the University requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the 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 the Contractor's property. The University reserves the right to take possession of project identification signs.
 2. Remove temporary paving not intended for or acceptable for in the University's opinion, integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.
 3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
 - a. Replace air filters and clean inside of ductwork and housings.
 - b. Replace significantly worn parts and parts subject to unusual operating conditions.
 - c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 015000

SECTION 016000 – MATERIALS AND EQUIPMENT, DELIVERY, STORAGE, AND HANDLING

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. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

1.3 DEFINITIONS

- A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature that is current as of the date of the Contract Documents.
 - b. "Foreign Products," as distinguished from "domestic products," are items substantially manufactured (50% or more of value) outside the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50%) by persons who are not citizens of, nor living within, the United States and its possessions are also considered to be foreign products.
2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 SUBMITTALS:

- A. All submittals shall comply with the requirements in the "SUBMITTALS" section.

1.5 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
 - 1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the University to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.
- B. Compatibility of Options: When the Contractor is given the option of selecting between two (2) or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
- C. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion in the Work:
 - 1. No available domestic product complies with the Contract Documents.
 - 2. Domestic products that comply with the Contract Documents are available only at prices or terms substantially higher than foreign products that comply with the Contract Documents.
- D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
 - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 – PRODUCTS

2.1 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with Contract Documents that are undamaged and new at time of installation.
 1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and intended use and effect.
 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Where products are accompanied by the term as selected, University will make selection.
 4. Where products are accompanied by the term match sample, sample to be matched is University's.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- A. General Compliance Requirements: Compliance requirements for individual products, as indicated in Contract Documents, are multiple in nature and may include generic descriptions, performance requirements, compliance with reference standards, conformance with graphic details and other similar forms and methods of indicating requirements, all of which must be complied with.
- B. Procedures for Selecting Products: Contractor's options for selecting products are limited by Contract Document requirements, and are not controlled by industry traditions or procedures experienced by Contractor on previous construction projects.

- C. Products specified by Reference Standards, Codes and Regulations: Select from among products which can be shown to comply to referenced documents.
- D. Products specified by Naming Products and Manufacturers: Select from among products listed.
- E. Products specified by naming one (1) Manufacturer's Product as the Basis-of-Design with Reference to Other Manufacturers: Select either the specified Basis-of-Design product or an approved comparable product by one of the other named manufacturers.
 - 1. Comply with provisions in Comparable Products Article to obtain approval for use of a comparable product by one of the named manufacturers.
- F. Products specified by naming one (1) Manufacturer's Product and Indicating Option of Selecting Comparable Products by stating or Approved Equivalent or similar language: Select either the specified product or an approved comparable product.
 - 1. Comply with provisions in Comparable Products Article to obtain approval for use of an unnamed comparable product by another manufacturer.
- G. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches University's sample. University's decision will be final on whether proposed product matches satisfactorily.
- H. Visual Selection Specification: Where Specifications include the phrase as selected from manufacturer's standard colors, patterns, textures or similar phrase, select a product that complies with other specified requirements. University will select color, pattern, and texture.
 - 1. Standard Range: Where Specifications include the phrase standard range of colors, patterns, textures or similar phrase, University will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 - 2. Full Range: Where Specifications include the phrase full range of colors, patterns, textures or similar phrase, University will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Where Basis-of-Design products are specified by name, submit the following, in addition to other required submittals, to obtain approval of a comparable product by one (1) of the named manufacturers:
 - 1. Evidence that the proposed product does not require extensive revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with the Basis-of-Design product in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, serviceability, 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 Universities, if requested.
5. Samples, if requested.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
 1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- B. Install products in accordance with the execution's sections of the Project Manual.

END OF SECTION 016000

SECTION 016310 – SUBSTITUTIONS

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. This Section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract.
- B. Contractor's submittal and University's acceptance of Shop Drawings, Product Data, or Samples not complying with Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval. Substitutions not properly authorized may be considered defective.

1.3 DEFINITIONS

- A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:
 - 1. Substitutions requested during the bidding period, and accepted by Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
 - 2. Revisions to the Contract Documents requested by the University or University.
 - 3. Specified options of products and construction methods included in the Contract Documents.
 - 4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

- A. Substitution Request Submittal: The University will consider requests for substitution if received within sixty (60) days after issuance of Notice to Proceed. Requests received more than sixty (60) days after issuance of Notice to Proceed may be considered or rejected at the discretion of the University.

1. Submit three (3) copies of each request for substitution for consideration. Submit requests in the form and according to procedures required for change-order proposals.
2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.
3. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the University and separate contractors that will be necessary to accommodate the proposed substitution.
 - b. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.
 - c. Product Data, including Drawings and descriptions of products and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - e. A statement indicating the substitution's effect on the Contractor's CPM Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
 - f. Cost information, including a proposal of the net change, if any in the Contract Sum.
 - g. The Contractor's certification that the proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
 - h. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
 - i. Confirmation that the same warranty will be furnished for substitute product as for specified product.

1.5 UNIVERSITY'S ACTION

- A. University will review and take appropriate action upon Contractor's request for substitutions.
 1. University's action will be taken with reasonable promptness, while allowing sufficient time in University's professional judgement to permit adequate review.
 2. University shall be entitled to rely upon adequacy, accuracy, and completeness of data, and certifications prepared by Contractor.
 3. If necessary, University will request additional information or documentation for evaluation after initial review of receipt of request for substitution.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 016310

SECTION 017000 – CONTRACT CLOSEOUT

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. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Project record document submittal, including the following:
 - 3. Marked-up copies of Contract Drawings.
 - 4. Marked-up copies of Shop Drawings.
 - 5. Newly prepared drawings.
 - 6. Marked-up copies of Specifications, addenda, and Change Orders.
 - 7. Marked-up Product Data submittals.
 - 8. Record Samples.
 - 9. Field records for variable and concealed conditions.
 - 10. Record information on Work that is recorded only schematically.
 - 11. Operation and maintenance manual submittal.
 - 12. Preparing and submitting operation and maintenance manuals for building operating systems and equipment.
 - 13. Preparing and submitting instruction manuals covering the care, preservation, and maintenance of University products and finishes.
 - 14. Instruction of the University's operating personnel in the operation and maintenance of building systems and equipment.
 - 15. Submittal of warranties.
 - 16. Final cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate Sections the specifications.
- C. Environmental Requirements: Conduct cleaning and waste-disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and antipollution regulations
 - 1. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains.
 - 2. Burning or burying of debris, rubbish, or other waste material on the premises is not permitted.

- D. Maintenance of 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. Make documents and Samples available at all times for the University's inspections.
- E. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 DEFINITIONS

- A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the University.
- B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the University.

1.4 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- B. 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.
- C. 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 the 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.
- D. University's Recourse: Expressed 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. Expressed warranty periods shall not be interpreted as limitations on the time in which the University can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The University reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the University reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.5 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.
 - a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
 - b. If 100% completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
 2. Advise the University of pending insurance changeover requirements.
 3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
 4. Obtain and submit releases enabling the University unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 5. Submit record drawings, maintenance manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
 6. Deliver tools, spare parts, extra stock, and similar items, including inventory list.
 7. Make final changeover of permanent locks and transmit keys to the University. Advise the University's personnel of changeover in security provisions.
 8. Complete startup testing of systems and instruction of the University's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
 9. Complete final cleanup requirements, including touchup painting.
 10. Touch up and otherwise repair and restore marred, exposed finishes.
- B. Inspection Procedures: On receipt of a request for inspection, the University will either proceed with inspection or advise the Contractor of unfilled requirements. The University will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The University will repeat inspection when requested and assured that the Work is substantially complete.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.6 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the University's final punch list of items to be completed or corrected, endorsed and dated by the University. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and will be endorsed and dated by the University.
4. Submit consent of surety to final payment.
5. Submit a final liquidated damages settlement statement.
6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Reinspection Procedure: The University will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the University.

1. Upon completion of reinspection, the University will prepare a certificate of final acceptance. If the Work is incomplete, the University will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, reinspection will be repeated.

1.7 QUALITY ASSURANCE

A. Maintenance Manual Preparation: In preparation of maintenance manuals, use personnel thoroughly trained and experienced in operation and maintenance of equipment or system involved.

1. Where maintenance manuals require written instructions, use personnel skilled in technical writing where necessary for communication of essential data.

2. Where maintenance manuals require drawings or diagrams, use draftsmen capable of preparing drawings clearly in an understandable format.

- B. Instructions for the University's Personnel: Use experienced instructors thoroughly trained and experienced in operation and maintenance of equipment or system involved to instruct the University's operation and maintenance personnel.

1.8 RECORD DOCUMENT SUBMITTALS

- A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the University's reference during normal working hours.

B. Record Drawings (As-Built):

1. Markup Procedure: During construction, maintain a set of blue- or black-line white prints of Contract Drawings and Shop Drawings for Project Record Document (As-Built) purposes.
 - a. Mark these Drawings to show the actual installation where the installation varies from the installation shown originally. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later. Items required to be marked include, but are not limited to, the following:
 - 1) Dimensional changes to the Drawings.
 - 2) Revisions to details shown on the Drawings.
 - 3) Revisions to routing of piping and conduits.
 - 4) Revisions to electrical circuitry.
 - 5) Actual equipment locations.
 - 6) Duct size and routing.
 - 7) Locations of concealed internal utilities.
 - 8) Changes made by change order.
 - 9) Changes made following the University's written orders.
 - 10) Details not on original Contract Drawings.
 - b. Mark record prints of Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings location.
 - c. Mark record sets with red erasable colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 - d. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - e. Note change-order numbers, and similar identification.
2. Responsibility for Markup: The individual or entity who obtained record data, whether the individual or entity is the Installer, subcontractor, or similar entity, shall prepare the markup on record drawings.

- a. Accurately record information in an understandable drawing technique.
- b. Record data as soon as possible after obtaining it. Record and check the markup prior to enclosing concealed installations.
- c. At time of Substantial Completion, submit record drawings to the University for the University's records. Organize into sets and bind and label sets for the University's continued use.

C. Record Specifications

1. During the construction period, maintain one copy of the Project Specifications, including addenda and modifications issued, for Project Record Document purposes.
 - a. Mark the Specifications to indicate the actual installation where the installation varies from that indicated in Specifications and modifications issued. Note related project record drawing information, where applicable. Give particular attention to substitutions, selection of product options, and information on concealed installations that would be difficult to identify or measure and record later.
 - 1) In each Specification Section where products, materials, or units of equipment are specified or scheduled, mark the copy with the proprietary name and model number of the product furnished.
 - 2) Record the name of the manufacturer, supplier, installer, and other information necessary to provide a record of selections made and to document coordination with record Product Data submittals and maintenance manuals.
 - 3) Note related record Product Data, where applicable. For each principal product specified, indicate whether record Product Data has been submitted in maintenance manual instead of submitted as record Product Data.
 - b. Upon completion of markup, submit record Specifications to the University.

D. Record Product Data: Maintain one (1) copy of each Product Data submittal. Note related Change Orders and markup of record drawings and Specifications.

1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
3. Upon completion of markup, submit three complete sets of record Product Data to the University for the University's records.

E. Record Sample Submitted: Immediately prior to Substantial Completion, the Contractor shall meet with the University and the University's personnel at the Project Site to determine which Samples are to be transmitted to the University for record purposes. Comply with the

University's instructions regarding delivery to the University's Sample storage area. Dispose of other samples in a manner specified for disposing surplus and waste materials.

F. Miscellaneous Record Submittals:

1. Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the University for the University's records.
 - a. Categories of requirements resulting in miscellaneous records include, but are not limited to, the following:
 - 1) Invert elevations of drainage piping.
 - 2) Certifications received in lieu of labels on bulk products.
 - 3) Batch mixing and bulk delivery records.
 - 4) Testing and qualification of tradesmen.
 - 5) Documented qualification of installation firms.
 - 6) Load and performance testing.
 - 7) Inspections and certifications by governing authorities.
 - 8) Final inspection and correction procedures.
 - 9) Pipe leakage test reports.
 - 10) Duct leakage test reports.
 - 11) Air balance reports.

G. Operation and Maintenance Manuals:

1. General Submission Requirements: The University of Maryland, Baltimore (UMB) requires operation and maintenance manuals (O&MM) to be submitted in electronic "pdf" file format, by the CM/GC, before substantial completion to the A/E and the University for review.
2. The CM/GC shall use the UMB Master O&M Template pdf file to create the Project O&M Manual. The file can be accessed through the D&C Web Site @ <https://www.umaryland.edu/designandconstruction/>. See View Current UMB Master O&M Template File.

1.9 INSTRUCTIONS FOR THE UNIVERSITY'S PERSONNEL

- A. Prior to final inspection, instruct the University's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Provide instruction at mutually agreed upon times.
 1. For equipment that requires seasonal operation, provide similar instruction during other seasons.

2. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.

PART 2 – PRODUCTS

2.1 MATERIALS

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

PART 3 – EXECUTION

3.1 CLOSEOUT PROCEDURES

- A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the University's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
 1. Maintenance manuals.
 2. Record documents.
 3. Spare materials.
 4. Cleaning.
 5. Warranties and bonds.
 6. Maintenance agreements and similar continuing commitments.
- B. As part of instruction for operating equipment, demonstrate the following procedures:
 1. Startup.
 2. Shutdown.
 3. Emergency operations.
 4. Safety procedures.
 5. Economy and efficiency adjustments.

3.2 FINAL CLEANING

- A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 01 Section "Construction Facilities and Temporary Controls."
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.
 - a. Clean the Project Site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and foreign substances.
 - b. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - c. Remove petrochemical spills, stains, and other foreign deposits.
 - d. Remove tools, construction equipment, machinery, and surplus material from the site.
 - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Broom clean concrete floors in unoccupied spaces.
 - h. Vacuum clean carpet and similar soft surfaces, removing debris and excess nap. Shampoo, if required.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent labels.
 - k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - q. Clean food-service equipment to a sanitary condition, ready and acceptable for its intended use.
 - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs and defective and noisy starters in fluorescent and mercury vapor fixtures.

- s. Leave the Project clean and ready for occupancy.
- C. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.
- D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the University's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.
 - 1. Where extra materials of value remain after completion of associated Work, they become the University's property. Dispose of these materials as directed by the University.

END OF SECTION 017000

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Sequenced demolition and removal of selected existing walls, roofs, structure, slabs, windows and storefront.
 - 2. Coordination of sequenced removal of existing materials with installation of new materials.
 - 3. Protection of existing items to remain and/or be reused.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.

1.3 DEFINITIONS

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

1.4 MATERIALS OWNERSHIP

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

1.5 PREINSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.

3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property for dust control and for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's and other tenants' on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of elevator and stairs.
 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- C. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- D. Pre-demolition Photographs or Video: Submit before Work begins.

1.7 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

1.8 PATCH, AND REPAIR

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Perform a survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
 - 2. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or videotapes.
 - 1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 - 5. Maintain adequate ventilation when using cutting torches.
 - 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

7. Remove existing windows and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly
- B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.
1. Existing masonry and metal stud and drywall openings to remain and shall be damaged as little as possible.
 2. Salvage any and all brick masonry that comes loose during removal of existing windows and curtainwall and keep for reinstallation/patching.
- C. Removed and Salvaged Items:
1. Clean salvaged items and transport items to Owner's storage area including but not limited to the following:
 - a. See Owner salvage list.
 2. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
1. Clean and reinstall items in locations and conditions where they were removed from.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Masonry: Cut or remove as little brick masonry as possible in order to accomplish the work and maintain conditions to allow for reinstall of brick masonry where possible.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General:
1. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

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

END OF SECTION 02 41 19

SECTION 03 01 30 – FLASH PATCHING OF EXISTING CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Repair and of existing concrete floor slabs in preparation for new floor finishes.
2. Flash patching of existing concrete floor slabs in preparation for new floor finishes.
3. Removal of any projecting portions of the existing abandoned electrical floor duct system.

B. Related Sections:

1. Section 09 65 19 - RESILIENT FLOORING.
2. Section 09 68 10 – CARPET TILE.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- ##### A. Product Data: For each type of product. Include construction details, material descriptions, chemical composition, physical properties, test data, and mixing, preparation, and application instructions.

1.4 INFORMATIONAL SUBMITTALS

- ##### A. Qualification Data: For installers and manufacturers.
- ##### B. Material Certificates: For each type of Portland cement and aggregate supplied for mixing or adding to products at Project site.
- ##### C. Product Test Reports: For each manufactured bonding agent, cementitious patching mortar, joint-filler, and crack injection adhesive, for tests performed by manufacturer and witnessed by a qualified testing agency.
- ##### D. Field quality-control reports.

1.5 QUALITY ASSURANCE

- ##### A. Manufacturer Qualifications: Manufacturer shall employ factory-trained technical representatives who are available for consultation and Project-site inspection and assistance at no additional cost.
- ##### B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer to apply packaged patching-mortar and repair materials.

1. Installer shall prove experience in application of patching and repair materials and with at least (3) successfully completed applications of similar materials in similar applications.
2. Coordination: Ensure proposed patching and repair materials are compatible with new floor coating materials.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.
- B. Store cementitious materials off the ground, under cover, and in a dry location.
- C. Store aggregates covered and in a dry location; maintain grading and other required characteristics and prevent contamination.

1.7 FIELD CONDITIONS

- A. The existing floor slabs are exposed to view on site. The installer shall review the existing field conditions prior to the start of work.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain each color, grade, finish, type, and variety of product from single source with resources to provide products of consistent quality in appearance and physical properties.
- B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

2.2 PATCHING MORTAR

- A. Patching Mortar, General:
 1. Only use patching mortars that are recommended by manufacturer for each applicable horizontal, vertical, or overhead use orientation.
 2. Coarse Aggregate for Patching Mortar: ASTM C 33, washed aggregate, Size No. 8, Class 5S. Add to patching-mortar mix only as permitted by patching-mortar manufacturer.
- B. Concrete Floor Patching and Repair Materials: Provide one of the following for patching the conditions encountered on site:
 1. Only use patching mortars that are recommended by manufacturer for each applicable horizontal, vertical, or overhead use orientation.
 2. Coarse Aggregate for Patching Mortar: ASTM C 33, washed aggregate, Size No. 8, Class 5S. Add to patching-mortar mix only as permitted by patching-mortar manufacturer.
- C. Cementitious Patching Mortar: Packaged, dry mix for repair of concrete.

1. Basis of Design Manufacturer and Products: Ardex.
 - a. Flash Patching: Portland cement-based self-drying cementitious flash patching material similar to “Ardex SD-F Feather Finish”.
 - b. Patching: Portland cement-based self-drying cementitious patching material similar to “Ardex SDP Insta-Patch”.
 - c. Self-Leveling: Portland cement-based cementitious self-leveling material similar to “Ardex K-15”. 4. Or approved equal
2. Equal Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
 - a. BASF Construction Chemicals - Building Systems.
 - b. Dayton Superior Corporation.
 - c. Euclid Chemical Company (The); an RPM company.
 - d. Sika Corporation; Construction Product Division.
 - e. Sto Corp.; Concrete Restoration Division.
 - f. W. R. Meadows, Inc.
3. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine existing concrete floor slabs to identify problem areas and plan the work.

3.2 PREPARATION

- A. Ensure that supervisory personnel are on-site and on duty when concrete maintenance work begins and during its progress.
- B. Remove any projecting portions of the existing abandoned electrical floor duct system.
- C. Patching and Repair of Existing Concrete Floors: Patch and repair existing floor substrate as required to provide smooth, level surface acceptable to receive new floor coating materials
- D. Preparation of Existing Floor: Prepare by acid etching, whip blasting or mechanical shot blasting as recommended by coating manufacturer.
- E. Concrete surface shall be free of loose or deteriorated concrete and free of dust, dirt, oil and all other contaminants. Mechanically abrade surface and clean as required.

3.3 APPLICATION

- A. General: Comply with manufacturer's written instructions and recommendations for application of products, including surface preparation.
- B. Placing Patching Mortar: Place as follows unless otherwise recommended in writing by manufacturer:
- C. Patching: Apply patching material to damaged areas with depressions over 1/8 inch deep.
- D. Levelness Tolerances: Apply floor patching and repair materials to provide levelness of floor substrate within at least 1/4 inch in 10 feet, unless more stringent levelness recommended or required by floor coating manufacturer.
- E. Flash Patching: Apply flash patching material to damaged areas with 1/8 inch or less depressions.
- F. Self-Leveling: Apply self-leveling material to large damaged areas where flash patching and patching described above cannot provide smooth, level surface acceptable to receive new floor coating materials.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:
 - 1. Packaged, Cementitious Patching Mortar: Four randomly selected sets of samples for each type of mortar required, tested according to ASTM C 928.
 - 2. Joint Filler: Core-drilled samples to verify proper installation.
 - a. Testing Frequency: One sample for each 100 feet of joint filled.
 - b. Where samples are taken, refill holes with joint filler.
- C. Product will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 03 01 30

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Wood blocking, cants, and nailers.
 - 2. Plywood backing panels.
- B. Related Requirements:
 - 1. Division 06 Section "Interior Architectural Woodwork" for interior woodwork.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and product indicated, submit manufacturer's specifications and other data needed to prove compliance with the specified requirements. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber:
 1. Boards: 15 percent.
 2. Dimension Lumber: 15 percent unless otherwise indicated.
- C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 MISCELLANEOUS LUMBER

- A. Composite wood installed within the building interior: Comply with low-emitting requirements of CARB, NAF or applicable standard in Division 01 Section "Sustainable Design Requirements – LEED".

- B. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
- C. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.
- D. Concealed Boards: 19 percent maximum moisture content and of any species
- E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.3 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.4 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

- B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- D. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
- F. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

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

3.3 INSTALLATION OF WOOD FURRING

- A. Install level and plumb with closure strips at edges and openings. Shim with composite wood as required for tolerance of finish work.

END OF SECTION 06 10 00

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running trim.
 - 2. Plastic-laminate cabinets
 - 3. Solid surface countertops.
 - 4. Closet and utility shelving.
 - 5. Shop finishing of interior woodwork
 - 6. Countertop supports.
 - 7. Cabinet hardware.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for wood blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
 - 2. Division 7 Sealants.
 - 3. Division 9 Painting.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Product Data: For panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, solid-surfacing material, fire-retardant-treated materials, cabinet hardware and accessories, handrail brackets, and finishing materials and processes.
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for other items installed in architectural woodwork.

4. Apply AWI-certified compliance label to first page of Shop Drawings.

C. Samples for Initial Selection:

1. Shop-applied transparent finishes (on board and veneer panels).
2. Plastic laminates (PVC edgings not permitted for exposed surfaces).
3. Thermoset decorative panels (for cabinet interiors and other non-exposed surfaces).
4. Solid-surfacing materials.

D. Samples for Verification:

1. Lumber with or for transparent finish, not less than [50 sq. in.] [5 inches wide by 24 inches long], for each species and cut, finished on 1 side and 1 edge.
2. Veneer-faced panel products with or for transparent finish, [8 by 10 inches] [12 by 24 inches], for each species and cut. Include at least one face-veneer seam and finish as specified.
3. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with 1 sample applied to core material] [and specified edge material applied to 1 edge].
4. Thermoset decorative-panels, 8 by 10 inches, for each type, color, pattern, and surface finish, with edge banding on 1 edge.
5. Solid-surfacing materials, 6 inches square.

E. Product Certificates: For each type of product, signed by product manufacturer.

F. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

G. Qualification Data: For fabricator/installer.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Fabricator of products and certified participant in AWI's Quality Certification Program.
- C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers and transparent-finished wood doors that are required to be of same species as woodwork.
- D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 1. Provide AWI Quality Certification Program labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.
 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.

- E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

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

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
 - 1. Recycled Content: Provide particleboard and MDF with minimum 80 percent recycled content; plastic panels with recycled content.
- B. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
 - a. Formica Corporation.
 - b. Nevamar Company, LLC; Decorative Products Div.
 - c. Pionite
 - d. Wilsonart International; Div. of Premark International, Inc.

2.2 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening (unless otherwise impractical), self-closing.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter, brushed stainless (typical).
- E. Z-clips/rails: as indicated.
- F. Adjustable Shelf Standards and Supports: Metal. Supports with round pegs to be inserted into holes in cabinet walls.
- G. Shelf Rests: as indicated
- H. Drawer Slides: BHMA A156.9, B05091.
 - 1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-overtravel-extension type; zinc-plated steel ball-bearing slides.
- I. Door Locks: BHMA A156.11, E07121.
- J. Drawer Locks: BHMA A156.11, E07041.
- K. Coat and wall hooks:
 - 1. polished aluminum double hook, Häfele 845.12.809 or approved equal.
- L. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Product: Subject to compliance with requirements, provide by Doug Mockett & Company, Inc.

- M. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. US32D, Satin Stainless steel.
- N. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 INTERIOR SOLID SURFACE WALL CAPS & APRONS

- A. General: Provide reinforced solid surface material. Compression molded compound that consists of a blend of polymer resins, fillers and reinforcement additives.
- B. **[SSM-1]** Basis of Design:
 - 1. Manufacturer: Corian
 - 2. Color: Deep Titanium

2.4 MISCELLANEOUS MATERIALS

- A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.5 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium-grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
 - 3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.
- D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check

measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

- E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.
- F. Install glass to comply with applicable requirements in Division 8 Section "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.6 PLASTIC-LAMINATE CABINETS

- A. Grade: Premium
- B. AWI Type of Cabinet Construction: Flush overlay.
- C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade [HGS] .
 - 2. Postformed Surfaces: Grade [HGP].
 - 3. Vertical Surfaces: Grade [HGS].
 - 4. Edges: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
- D. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS or Thermoset decorative panels.
 - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade [VGS] .
- E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
- F. Colors, Patterns, and Finishes:
 - 1. As selected by Architect from manufacturer's full range.
 - 2. **[PLAM-1]** Basis of Design: Wilsonart Premium Laminate
 - a. Color: Sumner Oak
 - b. Finish: Matte
- G. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops

2.7 CLOSET AND UTILITY SHELVING

- A. Grade: Custom.
- B. Shelf Material: 3/4-inch plastic laminate faced panel product.

- C. Cleats: Adjustable.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Maintain veneer sequence matching of cabinets with transparent finish.
 - 3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips .
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

3. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 4. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."
- H. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
- I. Refer to Division 9 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

3.3 ADJUSTING AND CLEANING

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

END OF SECTION 06 40 23

SECTION 07 21 00 - INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Mineral-wool blanket acoustic insulation.
- B. Related Sections:
 - 1. Section 092900 GYPSUM Assemblies.

1.3 ACTION SUBMITTALS

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

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MINERAL-WOOL BLANKET INSULATION (Acoustic)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Fibrex Insulations Inc.
 - 2. Owens Corning.
 - 3. Roxul Inc.
 - 4. Thermafiber.

- B. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. Formaldehyde-Free Mineral Wool.
- C. Acoustic insulation installed within the building interior: Comply with emissions requirements of CDPH Standard Test Method in Section 018113.
- D. Recycled Content: Provide mineral wool insulation with minimum 75 percent recycled content; provide polystyrene insulation with minimum 20 percent recycled content; provide glass fiber insulation with minimum 20 percent recycled content.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

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

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. ~~Glass-Fiber~~ or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

- C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

- 1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
- 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.4 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

- A. Where insulation blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated.

3.5 PROTECTION

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

END OF SECTION 07 21 00

SECTION 078100 - SPRAY-APPLIED FIRE RESISTIVE MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes Sprayed-Applied Fire-Resistive Materials (SFRMs) for the purpose of patching existing steel structure with spray fireproofing.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Framing plans, schedules, or both, indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from third party.
- D. Preconstruction Test Reports: For fireproofing.
- E. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 40 deg F 4.4 deg C or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours prior to, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing a minimum 4 complete air exchanges per hour and according to manufacturer's written instructions until Spray-Applied Fire Resistive Materials are dried and cured. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119/UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction.
- E. Low-Emitting Materials: Fireproofing used within the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. Asbestos: Provide products containing no detectable asbestos.
- G. Products shall possess DECLARE Label
 - 1. Declaration Status "LBC Red List Free"

2.2 SPRAY-APPLIED FIRE RESISTIVE MATERIALS

- A. SFRM: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design and mixed with water at Project site to form a slurry or mortar before conveyance and application or conveyed in a dry state and mixed with atomized water at place of application.
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Concealed/Commercial SFRMs:
 - a. Basis of Design: ISOLATEK International: CAFCO® 300 Series (ISOLATEK® Type 300 Series), CAFCO® BLAZE-SHIELD® II (ISOLATEK® Type II)
 - b. Approved equal.
 - c. Physical Properties:
 - 1) Bond Strength: Minimum 150-lbf/sq. ft. (7.18-kPa) cohesive and adhesive strength based on field testing according to ASTM E 736.
 - 2) Density: Not less than 15 lb/cu. ft. (240 kg/cu. m) as specified in the approved fire-resistance design, according to ASTM E 605.
 - 3) Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
 - 4) Combustion Characteristics: When tested in accordance with ASTM E 136 shall be noncombustible.
 - 5) Surface-Burning Characteristics: When tested in accordance with ASTM E 84 or CAN4-S102, the material shall exhibit the following surface burning characteristics:
 - a) Flame Spread Index [10] or less
 - b) Smoke Developed [10] or less
 - 6) Compressive Strength: When tested in accordance with ASTM E 761, the material shall not deform more than 10 percent when subjected to a crushing force of 1,440 psf (68.9 kPa).
 - 7) Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
 - 8) Deflection: No cracking, spalling, or delamination according to ASTM E 759.
 - 9) Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
 - 10) Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours according to ASTM E 859.
 - 11) Fungal Resistance: When tested in accordance with ASTM G21, the material shall show resistance to mold growth for a minimum period of 28

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:

1. Fireproofing manufacturer shall be contacted for procedures on handling primed/painted steel.
 2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.
- C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.
- D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.
- E. Reinforcing Fabric: Glass or carbon fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.
- G. Sealer: If required, a transparent-drying, water-dispersible, tinted protective coating as recommended by fireproofing manufacturer.
1. Product: Subject to compliance with requirements, provide:
 - a. Basis of Design: CAFCO® BOND-SEAL (ISOLATEK® Type EBS) or CAFCO® BOND-SEAL Type X (ISOLATEK® Type X) by ISOLATEK International.
 - b. Approved Equal.
- H. Topcoat: If required, a topcoat suitable for application over applied fireproofing; of type recommended by fireproofing manufacturer.
1. Cement-Based Topcoat: Factory-mixed, cementitious hard-coat formulation for trowel or spray application over SFRM.
 - a. Basis of Design Product: Subject to compliance with requirements, provide the following: CAFCO® FENDOLITE® M-II (ISOLATEK® Type M-II), CAFCO® FENDOLITE® TG (ISOLATEK® Type TG) by ISOLATEK International.
 - b. Approved Equal.
 2. Water-Based Permeable Topcoat: Factory-mixed formulation for brush, roller, or spray application over applied SFRM. Provide application at a rate of [30 sq. ft./gal. (0.75 sq. m/L)] [60 sq. ft./gal. (1.5 sq. m/L)] [120 sq. ft./gal. (3 sq. m/L)].

- a. Basis of Design Product: Subject to compliance with requirements, provide CAFCO® TOP-COTE (ISOLATEK® Type TOP-COTE) by ISOLATEK International.
- b. Approved Equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:
 1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 2. Clips, hangers, supports, sleeves and other attachments to the substrate are to be placed by others prior to the application of the fireproofing materials.
 3. The installation of ducts, piping, conduit or other suspended equipment shall not take place until the application of the fireproofing is complete in an area.
- B. Fire protection shall not be applied to steel floor decks prior to the completion of concrete work on that deck.
- C. The application of fireproofing to the underside of roof deck shall not commence until the roof is completely installed and tight, all penthouses are complete, all mechanical units have been placed, and construction roof traffic has ceased. When roof traffic is anticipated, as in the case of periodic maintenance, roofing pavers shall be installed as a walkway to distribute loads.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Metal Decks:
 - 1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, has been completed.
 - 2. Do not apply fireproofing to underside of metal roof deck until roofing has been completed; prohibit roof traffic during application and drying of fireproofing.
 - 3. When roof traffic is anticipated, as in the case of periodic maintenance, roofing pavers shall be installed as a walkway to distribute loads.
- E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
- F. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- G. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- I. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.
- J. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.

- K. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- L. Cure fireproofing according to fireproofing manufacturer's written recommendations.
- M. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- N. Finishes: Where indicated, apply fireproofing to produce the following finishes:
 - 1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
 - 2. Spray-Textured Finish: Finish left as spray-applied with no further treatment.
 - 3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.
 - 4. Skip-Troweled Finish: Even leveled surface produced by troweling spray-applied finish to smooth out the texture and neaten edges.
 - 5. Skip-Troweled Finish with Corner Beads: Even, leveled surface produced by troweling spray-applied finish to smooth out the texture, eliminate surface markings, and square off edges.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by Chapter 17 of the IBC.
 - 2. For reference, utilize AWCI - Inspection Procedure for Field-Applied Sprayed Fire-Resistive Materials, Technical Manual 12-A; an annotated guide.
- B. Test and inspect completed work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Application will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 078100

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Latex joint sealants.
4. Acoustical sealants.

B. Related Requirements:

1. Division 07 Section "Penetration Firestopping" for building joint-sealant systems.
2. Division 08 Section "Glazing" for glazing sealant.
3. Division 13 Section "Sound Isolation Component Assemblies" for acoustical joint sealant.

1.2 SUSTAINABILITY AND INDOOR ENVIRONMENTAL QUALITY REQUIREMENTS

- A. See Division 1 Specification Section 01 81 13 Sustainability and Indoor Environmental Quality Requirements

1.3 ACTION SUBMITTALS

A. Product Data:

1. Joint-sealants.
2. Joint sealant backing materials.

- B. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.
5. Use same reference designations as indicated in this Specification.

1.4 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports:

1. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

- a. Joint-sealant location and designation.
 - b. Manufacturer and product name.
 - c. Type of substrate material.
 - d. Proposed test.
 - e. Number of samples required.
 2. Preconstruction Laboratory Test Reports: For each joint sealant and substrate material to be tested from sealant manufacturer, indicating the following:
 - a. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - b. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
 3. Preconstruction Field-Adhesion-Test Reports: Refer to Division 01 Section "Exterior Enclosure Commissioning".
 - B. Field Quality-Control Submittals: Refer to Division 01 Section "Exterior Enclosure Commissioning".
 - C. Sample warranties.
- 1.5 CLOSEOUT SUBMITTALS
- A. A. Operation and Maintenance Data:
 1. Submit recommended inspection intervals.
 2. Submit instructions for repairing and replacing failed sealed joints.
 - B. Warranty Documentation:
 1. Manufacturers' special warranties.
 2. Installer's special warranties.
- 1.6 QUALITY ASSURANCE
- A. Qualifications:
 1. Installers: Authorized representative who is trained and approved by manufacturer for installation of units required for this Project. Provide SWRI (Sealant, Waterproofing and Restoration Institute) Validation Certificate.
 2. Testing Agency: Qualified in accordance with ASTM C1021 to conduct the testing indicated.
- 1.7 MOCKUPS
- A. Include joint sealants in integrated exterior mockup that will be used to demonstrate aesthetic effects, perform preconstruction testing, and to set quality standards for materials and installation. See Division 01 Section "Mockups" for additional construction requirements.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
 - 3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with stone and masonry substrates.
 - 4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
 - 5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
 - 7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.
- B. Preconstruction Field-Adhesion Testing: Refer to Division 01 Section "Exterior Enclosure Commissioning".

1.9 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.10 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: (2) years from date of Substantial Completion.
 - 2. Warranty Period: (20) years from date of Substantial Completion for silicone sealants
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

2.2 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 SILICONE JOINT SEALANTS

- A. S3 - Single Component, Non-Sag, Neutral-Curing Silicone: ASTM C920, Type S, Grade NS, Class 50, Uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Corning Corporation; 791, 795 or 995.
 - 2. Pecora Corporation; 864, 895 or 898.
 - 3. Tremco, Inc.; Spectrem 2, Proglaze SSG.
- B. S5 - Mildew-resistant, Single Component, Acid-Curing Silicone: ASTM C920, Type S, Grade NS, Class 25, uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
 - 1. BASF Building Systems; Omniplus
 - 2. Dow Corning Corporation; 786 Mildew Resistant.
 - 3. Tremco, Inc.; Tremsil 200 Sanitary.

2.4 LATEX JOINT SEALANTS

- A. L1 – Acrylic Latex or Siliconized Acrylic Latex, ASTM C834, Type OP, Grade NF. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
1. BASF Building Systems; Sonolac.
 2. Pecora Corporation; AC-20+.
 3. Tremco, Inc.; Tremflex 834.
- B. L2 - Acoustical Joint Sealant for Exposed and Concealed Joints: ASTM C1311 Manufacturer's standard Non-sag, paintable, no staining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
1. Tremco, Inc.; Acoustical Sealant.
 2. Pecora Corporation; AC-20 FTR, AIS-919.
 3. USG Corporation; SHEETROCK Acoustical Sealant.

2.5 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
1. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
 - a. Bostik, Inc.
 - b. Nomaco, Inc.
 - c. Pecora Corporation
 - d. Tremco, Inc.
- B. Cylindrical Sealant Backings: ASATM C 1330, of type indicated below and size and density to control sealant depth and otherwise contribute to producing optimum sealant performance, paired to the sealant type. List the type on the Sealant Schedule.
1. Type C: Closed-cell material with a surface skin.
 2. ~~Type O: Open-cell material.~~
 - a. Do not use open-cell backer rods at exterior sealant joints.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.

- b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.

4. Provide flush joint profile at locations indicated on Drawings in accordance with Figure 8B in ASTM C1193.
5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings in accordance with Figure 8C in ASTM C1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections: Refer to Division 01 Section "Exterior Enclosure Commissioning".

3.5 CLEANING

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

3.6 PROTECTION

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

3.7 JOINT-SEALANT SCHEDULE

<u>LOCATION</u>	<u>SYSTEM NO.</u>	<u>CUSTOM COLOR</u>
Metal/Metal	S3	Yes
Tile/Fixtures	S5	Yes
Painter's Caulk	L1	No
Interior Acoustical Joints	L2	No

END OF SECTION 07 92 00

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Solid core doors with wood veneer faces.
 - 2. Factory finishing wood doors.
 - 3. Factory fitting wood doors to frames and factory machining for hardware.
 - 4. Louvers installed in flush wood doors.

- B. Related Sections:

- 1. Division 08 Section "Hollow Metal Doors and Frames" for wood doors in steel frames.
 - 2. Division 08 Section "Glazing" for glass view panels in wood doors.
 - 3. Division 08 Section "Door Hardware" for door hardware for flush wood doors and wood frames.

- C. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.

- 1. ANSI A208.1 – Wood Particleboard.
 - 2. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
 - 3. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
 - 4. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
 - 5. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
 - 6. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.

1.3 SUBMITTALS

- A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, trim for openings, and WDMA I.S.1-A or AWS classifications. Include factory finishing specifications.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the wood door supplier in order to prepare the doors and frames to receive the finish hardware items.

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

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts and glazing thicknesses for glazed doors.
3. Indicate additional reinforcing for door stiles and rails and head/base rails for doors with glazed openings.
4. Indicate locations of gaskets for glazed openings in smoke doors.
5. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
6. Indicate requirements for veneer matching.
7. Indicate doors to be factory finished and finish requirements.
8. Indicate fire protection ratings for fire rated doors.

- D. Samples for Initial Selection: For factory finished doors.

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
2. Corner sections of doors, 8 by 10 inches, with door faces and edges representing actual materials to be used.
 - a. Provide samples for each species of veneer and solid lumber required.
 - b. Finish veneer faced door samples with same materials proposed for factory finished doors.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

- E. Informational Submittals:

1. Submit manufacturer's environmental documentation and applicable sustainability program credits that are available to contribute towards a LEED rated project certification.

- F. Warranty: Sample of special warranties.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer wherever possible.
1. Forest Certification: Provide wood products made from forests certified by an FSC-accredited certification body.
 - a. All non-FSC wood in assemblies with FSC-certified wood: Meet the FSC Controlled Wood (CW) criteria.
- B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors'.

- C. Provide doors with STC ratings as indicated on the drawings.
- D. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for receiving, handling, and installing flush wood doors.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.
 - c. Telegraphing of core construction and delaminating of face in decorative laminate-faced doors.
 - 2. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid Core Interior Doors: Life of installation according to manufacturer's written warranty.

PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION – GENERAL

- A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: Premium.

- B. Recycled Content: Provide composite wood door cores with minimum 60 percent recycled content; provide fire-rated doors with at least 20 percent recycled content.

2.2 CORE CONSTRUCTION

A. Particleboard Core Doors:

1. Particleboard: Wood fiber-based materials complying with ANSI A208.1 Particleboard standard. Grade LD-2.
2. Adhesive: Fully bonded construction using Low VOC Polyurethane (PUR) glue.
3. Blocking: When through-bolted hardware is not used, provide wood blocking in particleboard core doors as follows:

- a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
- b. 5-inch (125-mm) mid-rail blocking, in doors indicated to have exit devices.
- c. 5-inch (125-mm) bottom-rail blocking, in doors indicated to have kick, mop, or amor plate features.

- 1) Optional Cores for Blocking: Provide doors with either glued-wood-stave or structural-composite-lumber core instead of particleboard core for doors indicated to receive closers and exit devices.

4. Basis of Design:
 - a. Graham: PC, PC5
5. Or equal by one of the following:
 - a. VT Industries
 - b. Algoma Hardwoods
 - c. Marshfield Door Systems

VENEERED DOORS FOR TRANSPARENT FINISH

B. Interior Solid Core Doors:

1. Grade: Premium
2. Faces: Veneer grades as noted below; veneer minimum 1/50-inch (0.5mm) thickness at moisture content of 12% or less.
 - a. Quarter Sawn Select Red Oak, A grade faces.
3. Match between Veneer Leaves: Book match.
4. Assembly of Veneer Leaves on Door Faces:
 - a. Running Match.

5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
6. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.
7. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors
8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.
9. At doors over 40% of the face cut-out for lights and or louvers, furnish engineered composite lumber core.

2.3 LIGHT FRAMES AND GLAZING

- A. Metal Frames for Light Openings in Fire Rated Doors over 20-minute rating: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated.
- B. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with the flush wood door manufacturer's written instructions.

2.4 FABRICATION

- A. Factory fit doors to suit frame opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 1. Comply with requirements in NFPA 80 for fire rated doors.
- B. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.
- C. Openings: Cut and trim openings through doors in factory.
 1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."
 3. Louvers: Factory install louvers in prepared openings.

2.5 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.
 1. Grade: Premium.
 2. Finish: Meet or exceed WDMA I.S. 1A TR6 Catalyzed Polyurethane finish performance requirements.
 3. Staining: As selected by Architect from manufacturer's full range.
 4. Sheen: Satin.

2.6 WOOD SOUND CONTROL DOORS

- A. Doors: Flush-design wood sound control doors, thickness as required to provide STC rating, but not less than 1-3/4 inches (44 mm) thick; with manufacturer's standard sound-retardant core as required to provide STC and fire rating indicated. Fabricate according to WDMA 1.S.1-A. B. Materials: Comply with Section 081416 "Flush Wood Doors" for grade, faces, veneer matching, fabrication, finishing, and other requirements unless otherwise indicated. 1. Glazing: As required by wood sound control door assembly manufacturer to comply with sound control and fire-rated-door labeling requirements. C. Finishes: 1. Factory Finish.
- B. Sound Rating: Provide sound control door assemblies identical to those of assemblies tested as sound retardant units by an acoustical testing agency, and have the following minimum rating:
 1. STC Rating: Not less than 65 as calculated by ASTM E413 when tested in an operable condition according to ASTM E90.
- B. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C. 1. Smoke- and Draft Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."

- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

- 1. Install fire rated doors in corresponding fire rated frames according to NFPA 80.

- C. Factory Fitted Doors: Align in frames for uniform clearance at each edge.

- D. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Re-hang or replace doors that do not swing or operate freely.

- B. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Porcelain tile.
- 2. Waterproof membranes.
- 3. Crack isolation membranes.

- B. Related Requirements:

- 1. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
- 2. Division 09 Section "Gypsum Board" for tile backing panels.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. Face Size: Actual tile size, excluding spacer lugs.
- C. Module Size: Actual tile size plus joint width indicated.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Maryland Green Purchasing: Submit documentation that Flooring, Grout and adhesives comply with the Maryland Green Purchasing Flooring Specification.

<https://dgs.maryland.gov/Documents/GreenPurchasing/Specs/FlooringSpecification.pdf>

- C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- D. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
- E. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required
2. Full-size units of each type of trim and accessory for each color and finish required.
3. Metal edge strips in 6-inch lengths.

1.5 INFORMATIONAL SUBMITTALS

- A. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- B. Product Certificates: For each type of product.
- C. Product Test Reports: For tile-setting and -grouting products.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile from single source or producer.
 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
 1. Waterproof membrane.
 2. Crack isolation membrane.
 3. Metal edge strips.

1.8 MOCKUPS

- A. In-situ Mockup: Build mockups for each type and composition of tile and for each color and finish required to demonstrate aesthetic effects and to set quality standards for materials, fabrication, and installation.
 1. Size: (1) wall for each installation.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles below where products are specified, the following requirements shall apply:
 1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated or a comparable product another manufacturer.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.3 TILE PRODUCTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
 - 1. Crossville, Inc.
 - 2. Garden State Tile.
 - 3. Dal-Tile Group, Inc.
- B. Tile Types:
 - 1. CT-1
 - a. Manufacturer: Garden State Tile
 - b. Type: Porcelain
 - c. Collection: Clays
 - d. Color: Beige
 - e. Finish: Matte/Rectified Honed
 - f. Size: 12" x 24"
 - g. Installation: Floor, 1/3 offset, length of room
 - h. Location: Restrooms
 - 2. CT-1A
 - a. Manufacturer: Garden State Tile
 - b. Type: Porcelain
 - c. Collection: Vantage
 - d. Color: Dark Gray
 - e. Finish: Matte/Rectified Honed
 - f. Size: 2.4 x24"
 - g. Installation: Bullnose Base
 - h. Location: Restrooms

2.4 WATERPROOF MEMBRANES

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Waterproof and Crack Isolation Membrane, Fluid-Applied: Liquid-latex rubber or elastomeric polymer.

1. For shower applications, provide fast setting, flexible, thin, load-bearing, waterproofing membrane system consisting of a premixed, quick-drying liquid latex, for installation under ceramic tile or complying with ANSI A118.10 and ANSI A118.12; and having IAMPO certification as a shower pan liner.

- a. Basis-of-Design: Mapelastic AquaDefense

2.5 CRACK ISOLATION MEMBRANES

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Corrugated Polyethylene: Corrugated polyethylene with dovetail-shaped corrugations and with anchoring webbing on the underside; 3/16-inch (4-mm) nominal thickness.

1. Basis-of-Design: Schluter Systems L.P DITRA and KERDI-BAND

2.6 SETTING MATERIALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

1. MAPEI Corporation.
 2. Laticrete International, Inc.
 3. Custom Building Products.

- B. Latex/Polymer Modified Dry-Set Mortar (Thinset): ANSI A118.4.

1. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
 - a. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
 - 1) Basis-of-Design: MAPEI Ultraflex 2.
 - b. For large and heavy tile, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4 and A118.11
 - 1) Basis-of-Design: MAPEI Ultraflex LFT.

2.7 GROUT MATERIALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

1. MAPEI Corporation.
 2. Laticrete International, Inc.
 3. Custom Building Products.

- B. Polymer-Modified Tile Grout: ANSI A118.7.
 - 1. Basis-of-Design: MAPEI "Ultracolor Plus".
 - 2. Color: As selected by Architect from manufacturer's full range for each type of tile.
- C. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.

2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
 - 1. Basis-of-Design: MAPEI " Mapecem Quickpatch".
- B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications;
 - 1. Material & Finish: Aluminum; Satin Nickel Anodized.
 - 2. Basis-of-Design: Schluter-RONDEC
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
 - 1. Basis-of-Design: MAPEI "Ultracare" products.
- D. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 2. Verify that concrete substrates for tile floors comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION OF CERAMIC TILE

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- I. Metal Edge Strips: Install at locations indicated and where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
- J. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 INSTALLATION OF WATERPROOF MEMBRANES

- A. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.5 INSTALLATION OF CRACK ISOLATION MEMBRANES

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
- B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and

plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 09 30 13

SECTION 09 51 23 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes:
 - 1. Acoustical ceiling panels.
 - 2. Acoustical ceiling framing systems.
 - 3. Concealed and exposed suspension systems for ceilings.

1.3 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Retain first paragraph and subparagraphs below if Drawings do not include detailed reflected ceiling plans or if Project involves unusual coordination requirements.
- C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension members.
 - 2. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Minimum Drawing Scale: 1/8 inch = 1 foot.
- D. Samples for Initial Selection: For components with factory-applied color finishes.

- E. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.

1.5 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - b. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

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

1.8 COORDINATION

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

1.9 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents and ACT label # used in Construction Documents (RCPs).
 - 1. Acoustical Ceiling Units: Full-size panels equal to 5 percent of quantity installed of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795
- B. Recycled Content: Provide acoustical ceiling panels with minimum 50 percent recycled content; provide steel with minimum 25 percent post-consumer recycled content.
- C. Acoustical ceiling panels and suspension system: Comply with emissions requirements of CDPH Standard Test Method in ~~Section 018113~~.
- D. Ceilings in Core Learning Spaces: Minimum Noise Reduction Coefficient (NRC) of 0.70

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

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

2.3 PANELS FOR ACOUSTICAL TILE CEILINGS:

- A. Manufacturers:
1. USG Building Systems
 2. Armstrong World Industries
 3. Certain Teed Ceilings
 4. Celotex
- B. Basis of Design Products:
1. [ACT-1] Armstrong Ultima Acoustical Panels- 2x2, Tegular Edge Lay-In, 24 by 24 inch. Product number 1910 Class A. 15/16" Prelude Grid System.
- C. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
1. ACT-1 (Armstrong Ultima Acoustical Panels #1910)
 2. Type and Form: Type III, Wet-formed mineral fiber with factory applied vinyl latex painted finish; Form 2, pattern C E.
 - a. Color: White
 - b. LR: Not less than 0.83
 - c. NRC: Not less than 0.75
 - d. CAC: Not less than 35
 - e. Edge Detail: Tegular
 - f. Thickness: 3/4 inch
 - g. Size: 24 by 24 inches
 - h. Fire Class A

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.

2. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
 3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.
- D. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

2.5 METAL SUSPENSION SYSTEM FOR STANDARD TILE ACOUSTICAL PANEL CEILINGS

- A. Products:
1. Armstrong Ceilings (Basis-of-design): Prelude 15/16" exposed tee grid for Acoustical Panel Ceilings.
 2. USG Corporation: DX/DXL 15/16" exposed tee grid for Acoustical Panel Ceilings.
 3. Or approved equal.
- B. Wide-Face, Capped, Double-Web, Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653, not less than G30 coating designation, with prefinished 15/16-inch-wide metal caps on flanges.
1. Structural Classification: Heavy -duty system.
 2. End Condition of Cross Runners: Butt-edge type.
 3. Face Design: Flat, flush.
 4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: Painted.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers:
1. Armstrong World Industries, Inc., Basis of Design.
 2. Celotex Corporation; Architectural Ceilings Marketing Dept.
 3. Chicago Metallic Corporation.
 4. USG Interiors, Inc.
- B. Roll-Formed Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
1. For lay-in panels with reveal edge details, use standard edge moulding and kerf tile to reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
 3. For narrow-face suspension systems, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.

- C. Extruded aluminum Edge Mouldings: Provide manufacturer's product in profile indicated on Drawings, or if not indicated provide minimum 6" height fascia profile.

2.7 ACOUSTICAL SEALANT

A. Products:

1. Acoustical Sealant for Exposed and Concealed Joints:

- a. Pecora Corp; AC-20 FTR Acoustical and Insulation Sealant.
- b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

2. Acoustical Sealant for Concealed Joints:

- a. OSI Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
- b. OSI Sealants, Inc.; Pro-Series SC-175 Rubber Base Sound Sealant.
- c. Pecora Corp.; BA-98.
- d. Tremco, Inc.; Tremco Acoustical Sealant.

- B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION, GENERAL

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 7. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 8. Do not attach hangers to steel deck tabs.
 - 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 3. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

3.4 CLEANING

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

END OF SECTION 09 51 23

SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- B. This Section includes the following:
 - 1. Luxury Vinyl Tile (LVT)
- C. Related Sections include the following:
 - 1. Division 9 Section Resilient Wall Base and Accessories

1.3 SUBMITTALS

- D. Product Data: For each type of product indicated.
- E. Samples for Initial Selection: For each type of product indicated.
- F. Maintenance Data: For resilient products to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Forest Certification: Provide cork products made from forests certified by an FSC-accredited certification body. All non-FSC wood in assemblies with FSC-certified wood shall meet the FSC Controlled Wood (CW) criteria.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:

- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg for more than 95 deg F.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

1.8 EXTRA MATERIALS

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General:
 - 1. Resilient flooring, base and underlayment installed within the building interior: Comply with emissions requirements of CDPH Standard Test Method in Section 018113.
- B. Luxury Vinyl Tile Selections Armstrong Natural Creations w/Diamond 10 (basis-of-design)
 - 1. LVT- 1
 - a. Manufacturer: Armstrong Flooring
 - b. Number: NA193
 - c. Color: Avila Oak Vienna Smoke
 - d. Size: 6 inch x 36 inch x 0.125 inch.
 - e. Installation: Plank

2.2. ACCESSORY MATERIALS

- C. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement-based formulation provided or approved by resilient product manufacturer for applications indicated.
- D. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
- E. Follow manufacturer's recommendations for approved products and installation methods to validate warranties.

PART 3 - EXECUTION

3.1. EXAMINATION

- A. Coordinate requirements specified in other Sections for subfloor construction and tolerances to ensure that they are appropriate for resilient products selected

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

3.2. PREPARATION

- A. Extensive surface preparation is required over substrates from which existing products have been removed. Requirements vary among manufacturers. Insert requirements to suit Project.
- B. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- C. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 3. Moisture Testing:
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- D. 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.
- E. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- F. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 - 1. Do not install resilient floor tile until product is same temperature as space where it is to be installed.
- G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. TILE INSTALLATION

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis.

- B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).
- C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- D. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4. CLEANING AND PROTECTION

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

END OF SECTION 09 65 19

SECTION 09 65 30 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient Base.
 - 2. Resilient Molding Accessories.
- B. Related Sections:
 - 1. Division 9 Section "Resilient Floor Tile" for resilient floor tile.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.
- D. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 5%, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Tarkett.
 - 2. Allstate Rubber Corp.; Stoler Industries.
 - 3. Armstrong World Industries, Inc.
 - 4. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - 5. Endura Rubber Flooring; Division of Burke Industries, Inc.
 - 6. Estrie Products International; American Biltrite (Canada) Ltd.
 - 7. Flexco, Inc.
 - 8. Johnsonite
 - 9. Mondo Rubber International, Inc.
 - 10. Musson, R. C. Rubber Co.
 - 11. Nora Rubber Flooring; Freudenberg Building Systems, Inc.
 - 12. Roppe Corporation, USA.
- B. Resilient flooring, base and accessories: Comply with emissions requirements of CDPH Standard Test Method in Section 018113.

2.2 RESILIENT BASE

A. Resilient Base:

1. Material: Rubber.
2. Resilient Base Standard: ASTM F 1861.
3. Type (Material Requirement): Rubber
4. Group (Manufacturing Method): II (layered).
5. Style: Cove (with top-set toe).
6. Minimum Thickness: 0.125 inch.
7. Height: 4 inches.
8. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.
9. Outside Corners: Cut in Field.
10. Inside Corners: Cut in Field.
11. Surface: Smooth.

B. Colors and Patterns – Roppe (Rubber) as Basis of Design:

1. [RB-1]
 - a. Manufacturer: Roppe
 - b. Color: Black Brown
 - c. Number: 193
 - d. Style: 4" Standard Cove Base
 - e. Location: Typical base
2. [RB-2]
 - a. Manufacturer: Roppe
 - b. Color: Black
 - c. Number: 100
 - d. Style: 4" Standard Cove Base
 - e. Location: Replaced area of existing corridor

2.3 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:

1. Description: Carpet edge for glue-down applications, Reducer strip for resilient floor covering, Joiner for tile and carpet.
2. Thickness: 1/8"
3. Size: Lengths and depths to fit full length of each opening.
4. Colors: To be selected by Architect from full range of manufacturer's colors

B. Material: Rubber.

C. Profile and Dimensions: Full range of manufacturer's shapes & sizes.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), except that adhesive for rubber stair treads shall have a VOC content of 60 g/L or less.
- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.
- E. Floor Polish: Provide protective liquid floor polish products as recommended by resilient stair tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
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. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are same temperature as the space where they are to be installed.
 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
 2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.
 - 1. Apply manufacturer's recommended coat(s).
- E. Cover resilient products until Substantial Completion.

END OF SECTION 09 65 30

SECTION 09 68 10 - CARPET TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes modular construction carpet tiles and Walk-Off Mats.
- B. Related Sections include the following:
 - 1. Division 9 Section "Resilient Wall Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Pile direction.
 - 8. Type, color, and location of insets and borders.
 - 9. Type, color, and location of edge, transition, and other accessory strips.
 - 10. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch- (300-mm-) long Samples.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- E. Qualification Data: For Installer.

- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.
- G. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.
- H. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Mockups: Before installing carpet tile, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - 1. Review delivery, storage, and handling procedures.
 - 2. Review ambient conditions and ventilation procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 PROJECT CONDITIONS

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

- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.7 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
 - 3. Warranty Period: 15 year wear warranty.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 10 percent of amount installed for each type indicated, but not less than 6 sq. yd.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Carpet: Comply with emissions requirements of CDPH Standard Test Method.
- B. Recycled Content: Provide carpet with recycled content.

2.2 CARPET TILE

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following listed Basis of Design selections:
 - 1. [CPT-1]
 - Representative Product**
 - a. Manufacturer: J+J
 - b. Collection: Adapt
 - c. Number: 3272
 - d. Color: Azure Beam
 - e. Size: 24x24
 - f. Installation:
 - g. Location: as indicated on the drawings

2. [CPT-2]

Representative Product

- a. Manufacturer: J+J
- b. Collection: Adapt
- c. Number: 3267
- d. Color: Citrus Oasis
- e. Size: 24x24
- f. Installation:
- g. Location: as indicated on the drawings

3. [CPT-3]

Representative Product

- a. Manufacturer: J+J
- b. Collection: Adapt
- c. Number: 3277
- d. Color: Brick Path
- e. Size: 24x24
- f. Installation:
- g. Location: as indicated on the drawings

4. [CPT-4]

Representative Product

- a. Manufacturer: J+J
- b. Collection: Adapt
- c. Number: 3274
- d. Color: Plum Path
- e. Size: 24x24
- f. Installation:
- g. Location: as indicated on the drawings

2.3 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
 - 1. VOC Limits: Provide adhesives that comply with the following limits for VOC content when tested according to ASTM D 5116:
 - a. Total VOCs: 10.00 mg/sq. m x h.
 - b. Formaldehyde: 0.05 mg/sq. m x h.
 - c. 2-Ethyl-1-Hexanol: 3.00 mg/sq. m x h.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer and the following:
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lbs of water/1000 sq. ft. in 24 hours.
 - b. Perform an in situ probe RH (relative humidity) test, ASTM F2170 to ascertain the RH levels required by the manufacturer.
 - c. Perform a pH test as prescribed in the manufacturer's installation instructions.
 - 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. For painted subfloors, verify the following:
 - 1. Perform bond test recommended in writing by adhesive manufacturer.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm), unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer - install every tile with full-spread, releasable, pressure-sensitive adhesive.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. 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. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern based on building design and installation efficiencies. Architect to approve layout before installation.
- H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

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

END OF SECTION 09 68 10

SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
- D. Related Sections include the following:
 - 1. Division 8 Section "Steel Door Frames" for factory priming steel doors and frames.
 - 2. Division 9 Section "Gypsum Board" for surface preparation of gypsum board.

1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 - 3. Semi-Gloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
 - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
- B. Samples for Initial Selection: For each type of finish-coat material indicated.
 - 1. After color selection, Architect will furnish color chips for surfaces to be coated.
- C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
 - 1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 - 2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
- D. Qualification Data: For Applicator.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.
 - 1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate for evaluation of quality of finish coat and paint adhesion.
 - a. Wall Surfaces: Provide samples on at least 100 sq. ft.
 - b. Small Areas and Items: Architect will designate items or areas required.
 - 2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
 - 3. Final approval of colors will be from benchmark samples.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- B. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint Products: 2 gallons of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
 - 1. Benjamin Moore & Co. (Benjamin Moore).
 - 2. PPG Industries, Inc. (Pittsburgh Paints).
 - 3. Sherwin-Williams Co. (Sherwin-Williams), Basis of Design.
 - 4. Rosco Laboratories, Inc., Chroma Key Paint, Basis of Design

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Interior wet-applied paints and coatings: Comply with emissions requirements of CDPH Standard Test Method and VOC content limits in Section 048113.
- C. Prohibit Methylene chloride, lead, cadmium, and perchloroethylene in paints and coatings.
- D. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- E. Colors: As selected by Architect from manufacturer's full range. Refer to Part 3 of this Section.
 - 1. Anticipate **up to 4 exterior and 12 interior colors** for conventional paint products (refer to Finish Schedule). Gypsum Ceilings & Bulkheads to be Flat finish, Gypsum Walls to be Eggshell finish, Block walls to be Semi-Gloss finish, and Trim & Metals to be Semi-Gloss finish.

2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

- A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers.
 - 1. Sherwin-Williams; Interior/Exterior Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils., Basis of Design.

2.4 INTERIOR PRIMERS

- A. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
 - 1. Sherwin-Williams; ProMar 200 Zero VOC Latex Wall Primer B28W2600 Series: Applied at a dry film thickness of not less than 1.1 mils., Basis of Design.

2.5 INTERIOR FINISH COATS

- A. New Interior Gypsum Board Ceiling: Factory-formulated latex-based Flat finish for interior application.
 - 1. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Flat, B30 Series: Applied at a dry film thickness of not less than 1.7 mils., Basis of Design.
- B. Interior Low-Luster Acrylic Enamel: Factory-formulated Eggshell acrylic-latex interior enamel.

1. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Eg-Shel, B20W2651 Series: Applied at a dry film thickness of not less than 1.7 mils., Basis of Design.
- C. Interior Low-Luster Waterbased Epoxy for Areas subject to Frequent Cleanings, & Rest Room Wet Wall Areas: Factory-formulated Eg-Shel Water Based Epoxy.
 1. Sherwin-Williams; PRO Industrial Pre-Catalyzed Waterbased Epoxy, Eg-Shel, K45-1150 series: Applied at a dry film thickness of not less than 1.5 mils., Basis of Design.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
 1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 1. Provide barrier coats over incompatible primers or remove and reprime.
 2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze.

If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 - 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
 - 1. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 - 2. Provide finish coats that are compatible with primers used.
 - 3. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 - 4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 - 2. Omit primer over metal surfaces that have been shop primed and touchup painted.
 - 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 - 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- F. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- G. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.
- H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

- A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:
1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
 2. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

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

3.7 INTERIOR PAINT SCHEDULE

- A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
 - 1. Low-Luster / Eg-Shel Acrylic-Enamel Finish: Two finish coats over a primer.
 - a. Primer: Interior gypsum board primer.
 - b. Finish Coats for Walls: Interior low-luster / Eg-Shel acrylic enamel.
 - c. Finish Coats for Ceilings: Interior Flat acrylic.
 - d.

3.8 INTERIOR COLORS

- A. PT-1
 - 1. Manufacturer: Sherwin Williams
 - 2. Color: 9549
 - 3. Name: Touch of Grey
 - 4. Sheen: Eggshell
 - 5. Location: All walls.

END OF SECTION 09 91 00

SECTION 10 10 00 - VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Porcelain enamel marker boards - Magnetic.
 - 2. Tackboards
- B. Related Sections include the following:
 - 1. See Section 06100 Rough Carpentry for wood blocking and grounds.

1.3 SUBMITTALS

- A. Product Data: For each type of visual display board indicated. Include motor capacities and individual panel weights for markerboard units.
- B. Shop Drawings: For each type of visual display board required.
 - 1. Include dimensioned elevations. Show location of joints between individual panels where unit dimensions exceed maximum panel length.
 - 2. Include sections of typical trim members.
 - 3. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and textures available for the following:
 - 1. Markerboards: Actual sections of porcelain enamel finish for each type of chalkboard and markerboard required.
 - 2. Tackboards- Corner sections of frame.
- D. Samples for Verification: Of the following products, showing color and texture or finish selected. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected. Prepare Samples from the same material to be used for the Work.
 - 1. Visual Display Boards: Sample panels not less than 8-1/2 by 11 inches (215 by 280 mm), mounted on the substrate indicated for the final Work. Include a panel for each type, color, and texture required.
- E. Product Certificates: Signed by manufacturers of tackboards certifying that vinyl-fabric-faced cork

tackboard materials furnished comply with requirements specified for flame-spread ratings.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who is an authorized representative of chalkboard manufacturer for both installation and maintenance of the type of sliding chalkboard units required for this Project.
- B. Source Limitations: Obtain visual display boards through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of visual display boards and are based on the products indicated.
- D. Fire-Test-Response Characteristics: Provide vinyl-fabric-faced tackboards with the following surface-burning characteristics as determined by testing assembled materials composed of facings and backings identical to those required in this Section per ASTM E 84 by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify vinyl-fabric-faced tackboards with appropriate markings of applicable testing and inspecting agency.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 10 or less.
- E. Mockups: Before installing visual display boards, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work.
 - 1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before proceeding with fabrication of visual display boards.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. When directed, demolish and remove mockups from Project site.
 - b. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify field measurements before preparation of Shop Drawings and before fabrication to ensure proper fitting. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating chalkboards without field measurements. Coordinate wall construction to ensure actual dimensions correspond to established dimensions.

1.6 WARRANTY

- A. Porcelain Enamel Markerboard Warranty: Submit a written warranty executed by manufacturer agreeing to replace porcelain enamel chalkboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking within the specified warranty period, provided the manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Projection Quality Porcelain Steel Markerboards:

Representative Product Manufacturer:

- a. Claridge LCS Deluxe Porcelain Enamel Steel Dry-Erase Whiteboard

- 1) Porcelain Steel
- 2) Color/Finish: White, Smooth Matte. Projection quality.
- 3) Aluminum Frame
- 4) Aluminum Tray
- 5) Magnetic.
- 6) Size: Viewable Area 48"x96" (4'x8')
- 7) Tack rail: Natural cork in aluminum frame.

Equal Product Manufacturer:

- b. Greenstell
- c. ADP/Lemco, Inc.
- d. Best-Rite
- e. Egan Visual Inc.

2. Tackboards:

Representative Product Manufacturer:

- a. Claridge Edge Wrapped Tackboards are frameless fabric wrapped tackable boards with 2" radius corners.
 - 1) Tackable edge to edge Fabricork
 - 2) Color/Finish: KE592 GENTLEMAN GREY
 - 3) Size: as shown on the drawings.

2.2 MATERIALS

- A. Markerboards:
Porcelain-Enamel Face Sheet with magnetic backing: ASTM A 424, enameling-grade steel, uncoated thickness indicated; with exposed face and edges coated with primer, 1.7-to-2.5-mil- (0.043-to-0.064-mm-) thick ground coat, and color cover coat; and concealed face coated with primer and 1.7-to-2.5-mil- (0.043-to-0.064-mm-) thick ground coat.
 - 1. Gloss-Finish Cover Coat: Gloss as indicated; dry-erase markers wipe clean with dry cloth or standard eraser. Minimum 3.0-to-4.0-mil- (0.076-to-0.102-mm-) thick cover coat. Cover and ground coats shall be fused to steel at manufacturer's standard firing temperatures but not less than 1475 deg F (802 deg C).
 - a. Color: Matte White: Low glare and distortion free optical quality surface allows for use as a projection screen.
 - b. Pen tray.

2.3 MARKERBOARD ACCESSORIES

- A. Trim and Accessories:
 - 1. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.
 - 2. Markertrays:
 - a. Manufacturer's standard, continuous, aluminum, Markertray.

2.4 FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine wall surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of visual display boards.
 - 1. Surfaces to receive markerboards shall be free of dirt, scaling paint, and projections or depressions that would affect smooth, finished surfaces of chalkboards or markerboards.
 - 2. Surfaces to receive tackboards shall be dry and free of substances that would impair the bond between tackboards and substrate.
 - 3. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF MARKERBOARDS

- A. Deliver factory-built visual display boards completely assembled in one piece without joints, where

possible. If dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

- B. Install units in locations and at mounting heights indicated and according to manufacturer's written instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- C. Coordinate Project-site-assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

3.3 ADJUSTING AND CLEANING

- A. Verify that accessories required for each unit have been properly installed and that operating units function properly.
- B. Clean units according to manufacturer's written instructions.

END OF SECTION 101000

SECTION 101400 – INTERIOR SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Room signs.
 - 2. Directional and Informational Signs.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include material descriptions including manufacturer and product number of each individual component making up the sign, including:
 - 1. Acrylic base sheet ¼” thick, Type UVA.
 - 2. Cast acrylic sheet for front face of window inserts, .080” thick, Type UVF
 - 3. Rigid vinyl filler .030 thick.
 - 4. Surface Overlay 1/16” thick with brushed plastic aluminum overlay.
 - 5. Matte black acrylic 1/16” used for Tactile Characters
 - 6. Paint for back face of ¼” acrylic base sheet.
 - 7. Magnetic sheet material used as mounting for bottom panel of Signs A.05 & A.06.
 - 8. Acrylic plastic cement used for fuse bonding of tactile characters.
- B. Samples for Verification: For each type of sign assembly listed below, in size and layout indicated on drawings. Full-size Samples may be retained and used as permanent.
 - 1. Full-size sample of sign that includes inserts (A.01 or 03).
 - 2. Full-size sample of sign that include magnetic panel (A.05 or 06).
- C. Qualification Data: For Fabricator.
 - 1. Fabricator of sign shall list accurate location of where signs are to be manufactured, and list name of equipment used to route female cavity for tactile letters.
 - 2. Fabricator of sign must be prequalified by the University to assure quality and craftsmanship of sign for consistency. No fabrication samples will be reviewed

for acceptance by the University during the shop drawing process. Current pre-qualified sign fabricators are as follows:

a. Inter Sign National: 1123 E Baltimore St., Baltimore, MD 21202

- D. Sign Proofs: For each sign indicated on sign schedule. Provide full size (or at least half-size) elevation and section, with dimensions and indicators of each material used, including painted surface.
- E. Sign Message Schedule: Use same designations indicated on the Drawings. Indicate the following for each sign:
 - 1. Building.
 - 2. Floor Level.
 - 3. Room Number.
 - 4. Sign message.
 - 5. Sign type.
 - 6. Special requirements.
- F. Sample Warranty: Provide sample 2 year warranty.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative of signage manufacturer for installation and maintenance of units required for this Project.
- B. Source limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
- C. Regulatory Requirements: Comply with applicable provision of the following codes and regulations:
 - 1. ICC International Building Code, 2018 Edition.
 - 2. ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1

2.2 DESIGN

1. Design of the graphic image shall consist of characters and symbols shall contrast with their background. Both the characters and the background of the signs shall have a non-glare finish.
2. All signs shall be frameless and corners shall be essentially square with a slightly eased edge (rather than sharp).
3. Materials approved for fabrication are to provide a consistent appearance for all signs, and to facilitate exact matching of existing and future sign installations by the University.

2.3 MATERIALS AND ASSEMBLY

- A. Acrylic Base (full size of sign): ¼” rigid, clear acrylic: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing). Screen printed or painted silver finish on back, Pantone #877c or MP Brushed Aluminum. Cut edges not to be polished.
1. Shadow Backplate (full size of sign) to protect painted back surface of acrylic base sheet.
 - a. Product: .015 clear lexan or .015 rigid vinyl backing subsurface painted to match PMS 877.
 - b. Laminate to backside of base to protect base painted surface.
- B. Surface Overlay: ABS Sheet with Metallic Finish (1/16” and full size of sign): Provide brushed plastic aluminum 1/16” thick 2-ply micro-surfaced ABS with hardware protective surface, matte finish with black core.
1. Product: Subject to compliance with requirements, provide Innovative Plastics, Inc.: The Hardware Series, Metallic Plastics, Surface Color Brushed Aluminum, Core Color Black, Matte Finish, Model H-391M.
- C. Tactile Characters:
1. Typeface: Futura Book ACCT.AD.REV.F as manufactured by Gerber Scientific for Omega Software, ¾” high or as otherwise indicated.
 2. Tactile is to be embedded 1/32” into perfectly routed female cavity.
 - a. Routing of embedded cavity shall be sharp and shall not be visible (no rounded edges or visible gaps due to dull cutting tools).

3. Tactile characters are to be chemically fused into cavity using Weld-On 4 Acrylic Plastic Cement. Adhesive backed and surface of sign applied letters are not acceptable.
 4. Product: Rigid matte black acrylic, Rowmark LLC; ADA Alternative Applique, Black Color, Item No. 321-401 (1-ply .1/16" thick).
- D. Braille: Braille to comply with ADA-ABA Accessibility Guidelines, ICC/ANSI A117.1, and be "Grade II" raster style and shall conform to National Library Service Specification #800, Library of Congress.
1. Apply Braille using a computerized mechanical engraving or routing manufacturing process, height to be a uniform height above surface of sign inches of sign with domed or rounded shape.
 2. Braille dots to be clear (black subcolor of ABS sheet will come through).
- E. BUILDUP TO CREATE INSERT WINDOW SLOT(S)
1. .080" thick cast acrylic "window face" laminated to .030 thick clear rigid vinyl fillers. Fillers are omitted at insert area to create a slot that is 1/16" above and 1/16" below the insert "window" face. Fillers are laminated to the 1/4" thick acrylic base. For window sizes see drawings for dimension.
 - a. Window Face Product: .080" thick cast acrylic, Shinkolite by Mitsubishi Chemical.
 - b. Filler Product: .030 rigid vinyl filler.
- F. SIGNS WITH REMOVABLE FACEPLATE (Types A.05 & A.06)
1. Acrylic Base (full size of sign- 9" wide x 6" high): 1/4" rigid, clear acrylic: As specified in 2.2.A, with shadow backplate.
 2. Top Face Panel:
 - a. Cast Acrylic Sheet (9" wide x 3" high): .10" thick and full width of sign, ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering). Color: Black.
 - 1) Laminate vinyl filler between top panel and 1/4" Acrylic Base. Filler thickness to match magnetic sheets of bottom panel for a uniform surface.
 - b. Surface Overlay (1/16" thick, full width of sign): As specified in 2.2.B.
 - c. Tactile Characters: As specified in 2.2.C.
 - d. Braille: As specified in 2.2.D.
 3. Bottom Face Panel (removable)
 - a. Cast Acrylic Sheet: (9" wide x 3" high): .10" thick and full width of sign, ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering). Color: Black.
 - 1) Provide magnetic sheet laminated to back of bottom panel with receiver metal sheet laminated to acrylic base sheet, hold back 1/8" min. on all sides.

- b. Surface Overlay (1/16" thick, full width of sign): As specified in 2.2.B.
 - 1) Omit 1/8" of surface overlay at top of bottom panel to create a reveal, full width of sign.
- c. Engraved letters, route surface overlay to reveal black acrylic sheet.

G. ACCESSORIES

- H. Two-Face Tape: Manufacturer's standard high-bond tape, 3M Brand's VHB Tape 4941 or VHB Tape 5952.

2.4 FABRICATION

- A. Mill joints to a tight, hairline fit.
- B. Signs with Changeable Inserted Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
 - 1. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert.
 - 2. Provide window slots for paper inserts that are 1/8" higher than the windows and centered vertically on the windows, as indicated.

2.5 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable.
- C. Directional Finishes: Run grain horizontal to the floor.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Locate signs and accessories where indicated, using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, with sign surfaces free of distortion and other defects in appearance.
 - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 3. Mounting Location: Mounting shall be consistent with ADA regulations.
 - a. Signs shall be mounted so that the top of the sign is 61" above finished floor.
 - 1) If the sign is to be installed at a location near existing signage, match the existing sign height provided it complies with the ADA

requirement for the centerline to be 54” to 60” above the finished floor.

- b. Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs at nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Mounting Methods:

1. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
 - a. Do not use this method for vinyl-covered or rough surfaces.
2. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces. Use two-face tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
3. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials, or apply sign with pressure sensitive vinyl shadows.

3.2 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements.
- B. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish.

END OF SECTION 101400

SECTION 10 26 60 – CORNER GUARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Corner guards.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes for each impact-resistant wall-protection unit.
- B. Shop Drawings: For each impact-resistant wall-protection unit showing locations and extent. Include sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated.
 - 1. Include similar Samples of accent strips and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Corner Guards: 12 inches long. Coordinate first paragraph below with qualification requirements in Division 1 Section "Quality Requirements" and as supplemented in "Quality Assurance" Article.
- E. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain impact-resistant wall-protection units through one source from a single manufacturer.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls, columns, and other construction contiguous with impact-resistant wall-protection units by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall-protection units that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period: 5 years from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Corner-Guards: 5 percent of each type, color, and texture of cover installed, but no fewer than five 60 inch long units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - 2. Basis-of-Design Product: The design for each impact-resistant wall-protection unit is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 CORNER GUARDS

- A. Surface-Mounted, PETG Corner Guards on extruded aluminum retainers with formed edges; with 90- or 110-degree turn to match wall condition.
- B. Representative Product: Model SM20 for odd angles (90 degrees; 110 degrees – verify in field) by Acrovyn (Construction Specialties).
 - 1. Equal Manufacturers:
 - a. American Floor Products Co., Inc.
 - b. ARDEN Architectural Specialties, Inc.
 - c. Balco, Inc.
 - d. Boston Retail Products.
 - e. Construction Specialties, Inc.
 - f. IPC Door and Wall Protection Systems; Division of InPro Corporation.

- g. Pawling Corporation.
- h. Koroseal Interior Products Group.

2. Material: PETG (OPVC Free)

- a. Thickness: Minimum 0.0781 inch.
- b. Color: As selected by Architect from manufacturers full range.

2.3 FABRICATION

- A. Fabricate impact-resistant wall-protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
- B. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 - 1. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall-protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. General: Install impact-resistant wall-protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 26 60

SECTION 10 44 16 – FIRE EXTINGUISHERS AND FIRE EXTINGUISHER CABINETS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Portable fire extinguishers.
 - 2. Fire-protection cabinets

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of cabinet finish indicated.
- C. Samples for Verification: For each type of exposed cabinet finish required, prepared on Samples of size indicated below and of same thickness and material indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
 - 1. Size: 6-by-6-inch-square Samples.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide extinguishers listed and labeled by FM.

1.5 COORDINATION

- A. Coordinate size of cabinets to ensure that type and capacity of fire extinguishers indicated and provided by Owner under separate Contract are accommodated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Portable Fire Extinguishers:
 - a. Kidde.
 - 2. Fire-Protection Cabinets:
 - a. Activar Construction Products Group, Inc. - JL Industries.
 - b. Guardian Fire Equipment, Inc.
 - c. Larsens Manufacturing Company.
 - d. Nystrom.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality, stretcher leveled, temper rolled.

2.3 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.
- B. Multipurpose Dry-Chemical Type: Kidde Model FX340SC-2, 3A:40B:C, 5 lb.

2.4 FIRE-PROTECTION CABINETS

- A. Cabinet Type: Suitable **for fire extinguisher**.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Activar Construction Products Group, Inc. - JL Industries.
 - b. Guardian Fire Equipment, Inc.
 - c. Larsens Manufacturing Company.
 - d. Nystrom.

2. Cabinet Construction: Nonrated Cold-rolled steel sheet, ASTM A1008/A1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
 - b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - c. Color: White
 - B. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
 1. Rolled-Edge Trim: 2-1/2-inch backbend depth.
 - C. Cabinet Trim Material: Steel Sheet.
 - D. Door Material: Steel sheet
 - E. Door Style: Vertical duo panel with frame.
 - F. Door Glazing: Transparent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), 3 mm thick, with Finish 1 (smooth or polished).
 - G. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 1. Provide projecting door pull and friction latch. LOCKS ARE NOT ALLOWED.
 2. Provide manufacturer's standard continuous hinge, permitting door to open 180 degrees.
- 2.5 ACCESSORIES
- A. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Architect.
 1. Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.
 - a. Application Process: Silk-screened.
 - b. Lettering Color: Red on metal face (not glass face).
 - c. Orientation: Vertical.
- 2.6 COLORS AND TEXTURES

- A. Colors and Textures: As selected by Architect from manufacturer's full range for these characteristics.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Cabinet and Door Finishes: Provide manufacturer's standard baked-enamel paint for the following:
 - 1. Exterior of cabinets and doors, except for those surfaces indicated to receive another finish.
 - 2. Interior of cabinets and doors.

2.8 STEEL FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.
 - 1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- C. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for cabinets to verify actual locations of piping connections before cabinet installation.

- B. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets are to be installed.
- C. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged units.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing fire-protection specialties.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 - 1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust cabinet doors that do not swing or operate freely.
- B. Refinish or replace cabinets and doors damaged during installation.
- C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10 44 16

SECTION 010450 – CUTTING AND PATCHING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the requirements for cutting and patching.

1.3 SUBMITTALS

- A. Cutting and Patching Proposal: When unforeseen conditions require cutting and patching of the existing structure and/or related components the CM shall submit a cutting and patching proposal to the university, for review and approval before proceeding with any work. Include the following information, as applicable, in the proposal:
 - 1. Describe the extent of cutting and patching required and indicate why it cannot be avoided. Include changes to the building's appearance and other significant visual elements if applicable.
 - 2. Describe the products to be used.
 - 3. Identify the impact to the project's schedule and budget.
 - 4. Indicate the dates when cutting and patching will be performed.
 - 5. Where cutting and patching involves adding reinforcement to structural elements, the modifications to the structure shall be designed by a registered structural engineer. If the design team does not include a structural engineer the CM shall secure the services of an engineer to perform the required design. The CM shall submit the design drawings, details and engineering calculations showing integration of reinforcement with the original structure to the University.
 - 6. Approval by the University to proceed with cutting and patching does not waive the University's right to later require complete removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
 - 1. Obtain hot work permit from the University for cutting, burning, welding, etc. (See attached).
 - 2. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
 - a. Structural concrete.
 - b. Structural decking.
 - c. Miscellaneous structural metals.
 - d. Equipment supports.
 - e. Piping, ductwork, vessels, and equipment.
- B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating

elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal from the University before cutting and patching the following operating elements or safety related systems:
 - a. Primary operational systems and equipment.
 - b. Air or smoke barriers.
 - c. Water, moisture, or vapor barriers.
 - d. Fire protection systems.
 - e. Control systems.
 - f. Communication systems.
 - g. Electrical wiring systems.
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the University's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner when directed by the University.
 1. If possible, retain the original Installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original Installer or fabricator, engage another recognized experienced and specialized firm.
 - a. Acoustical ceilings.
 - b. Carpeting.
- D. Cutting and Patching Responsibilities:
 1. Cutting: cutting shall be the work of the trade requiring the cutting for access, or for permitting the alteration to be performed or an approved subcontractor designated by the trade or the CM.
 - a. Cutting required for inspections shall be the work of the CM/GC.
 - b. Cutting required to obtain test samples of suspected hazardous materials shall be the work of a contractor licensed for the removal of hazardous materials.
 2. Patching: Patching shall be the work of the appropriate trade.
 - a. Maintain the rating of fire rated barriers, using approved sealant products.
 3. Fire Rated Barriers: Where existing fire rated barriers, located in the project area, have unsealed openings for mechanical and electrical work, these openings shall be sealed using the approved sealant products to maintain the fire rating of the barrier.

1.5 WARRANTY

- A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

- A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. For building exterior or visible interior elements, the Architect and the UMB representative

must approve substitutions. Use materials whose installed performance will equal or surpass that of existing materials. Refer to applicable spec sections for materials.

PART 3 – EXECUTION

3.1 CONSTRUCTION WORK – EXCESSIVE NOISE

- A. All construction work that creates excessive noise will not be permitted during normal business hours, 8:00am to 5:00pm (M-F) or 8:00am to 8:00pm (weekends). Work such as core drilling floors, cutting masonry construction or other materials, or inserting hangers in floor slabs shall be scheduled between 5:00am and 8:00am (M-F) or 10:00pm to 8:00am (weekends). Coordinate actual time frames with UMB – Project Manager.

3.2 INSPECTION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.
 - 1. Before proceeding, meet at the Project Site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.3 PREPARATION

- A. Temporary Support: Provide temporary support of work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them or to take them out of service.

3.4 PERFORMANCE

- A. General: Employ skilled workmen or experienced subcontractors to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.
 - 1. In general, when cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required,

- and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
 4. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Ensure all services have been de-energized or drained before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
 2. 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.
 3. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat. Prepare entire surface to receive final coat as necessary for proper adhesion.
 4. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.5 PAINTING

- A. Extent of Painting:
1. Paint over the entire surface plane, unless otherwise noted.
 2. Over patched surfaces paint to the nearest cut off line for the entire surface, such as the intersection with adjacent wall, ceiling, beam, bulkhead, or to the nearest opening frame where a total cut off does not occur within ten (10) feet of the patch, unless otherwise noted.
- B. Appearance and Finish:
1. Appearance: Ensure painted surfaces do not present a spotty, touched-up appearance.
 2. Finish: Provide a smooth continuous surface in texture, coverage and color.

3.6 CLEANING

- A. Areas and spaces where cutting, and patching are performed shall be cleaned. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 010450

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Penetration firestopping systems for the following applications:
 - a. Penetrations in fire-resistance-rated walls.
 - b. Penetrations in horizontal assemblies.
 - c. Penetrations in smoke barriers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each penetration firestopping system. Include type of barrier being penetrated (with rating), size and type of penetrating material, UL System Number, and firestop product name.
- C. UL System Detail: For each penetrating firestopping system.
 - 1. Where project conditions require modification to a qualified testing and inspecting agency's illustration for a particular firestop condition, submit illustration, with modifications marked, approved by firestop system manufacturer's fire-protection engineer as an engineering judgement or equivalent system.
- D. Qualification Data: For Installer(s). Provide manufacturer's training certificates for all installers.
- E. All project penetrations shall be combined into a single Penetration Firestopping submittal. Partial submittals will be rejected.

1.4 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

1.6 PROJECT CONDITIONS

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

1.7 COORDINATION

- A. CM/GC to coordinate location and sizing of sleeves, openings, and penetrating items to ensure that penetration firestopping systems can be installed according to the approved firestopping system design.
- B. Do not paint or conceal any firestopping system until installation has been approved by the UMB Fire Marshal.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) FM Approval in its "Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 - 1. Manufacturer's: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products

- b. Hilti, Inc.
 - c. Tremco, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
 - 1. Permanent forming/damming/backing materials.
 - 2. Substrate primers.
 - 3. Collars.
- E. Fire and Fire/Smoke Dampers: The annular space around fire and fire/smoke dampers shall be sealed according to the manufacturer's installation instructions. Firestopping may or may not be required, as recommended by the damper manufacturer.

2.3 PENETRATIONS IN HORIZONTAL ASSEMBLIES

- A. Pipe sleeves are required for all new penetrations floor penetrations. Sleeve must be black steel and extend at least 1" above finished floor surface. GC is responsible for coordinating the installation of pipe sleeves prior to installing penetrating item.
- B. Provide a UL Class 1 W-Rated firestop system for all new and existing floor penetrations.

2.4 PENETRATIONS IN VERTICAL ASSEMBLIES

- A. Pipe sleeves are required for all new penetrations in fire rated walls.
- B. Pipe sleeves are required at all penetrations in CMU walls (both rated and nonrated).
- C. Pipe sleeves installed in walls must be installed flush with both sides of the wall that is penetrated. Sleeves shall be black steel.

- D. GC is responsible for coordinating the installation of pipe sleeves prior to installing penetrating item.

2.5 FILL MATERIALS (If required for particular product)

- A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- D. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- G. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.6 MIXING (If required for particular product)

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "X HOUR FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes. Replace X with 1, 2, or 3 hr fire rating.
 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 10 feet (4.57 m) from end of wall and at intervals not exceeding 20 feet (9.14 m).
 2. In mechanical equipment rooms, electrical rooms, tele data rooms and utility shaft areas without ceilings, wall identification shall occur at 15 ft intervals at a height of 10 ft above finished floor level.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 4 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 2. Firestop contractor's name.
 3. UL Design No. of firestop assembly.
 4. Date of installation.
 5. Manufacturer's name.
 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. University will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.
- B. Where deficiencies are found or penetration firestopping systems are damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.
- D. Contractor shall be responsible for ensuring all penetrations are correctly firestopped prior to requesting the qualified testing agency inspection. Costs for re-inspections and repeat site visits will be at the contractor's expense.

3.6 CLEANING AND PROTECTION

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

END OF SECTION 078413

SECTION 081113 - HOLLOW METAL DOOR FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Standard and custom hollow metal frames.

- B. Related Sections:

- 1. Division 01 Section "General Conditions".
 - 2. Division 04 Section "Masonry".
 - 3. Division 06 Section "Rough Carpentry".
 - 4. Division 06 Section "Finish Carpentry".
 - 5. Division 08 Section "Operations and Maintenance".
 - 6. Division 08 Section "Flush Wood Doors".
 - 7. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
 - 8. Division 08 Section "Glazing".
 - 9. Division 08 Section "Door Hardware".
 - 10. Division 09 Sections "Painting".
 - 11. Division 26 Section "Electrical"

- C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

- 1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
 - 2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
 - 3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
 - 4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
 - 5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
 - 6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - 9. SDI-113 Standard Practice for Determining the Steady-State Thermal Transmittance of Steel Door & Frame Assemblies.

10. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
11. ASTM C1199 - Standard Test Method for Measuring the Steady-State Thermal Transmittance of Fenestration Systems Using Hot Box Methods
12. ASTM E1423 - Practice for Determining Steady State Thermal Transmittance of Fenestration Systems.
13. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
14. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
15. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
16. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
17. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
18. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
19. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- C. Shop Drawings: Include the following:
 1. Elevations of each door design.
 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of anchorages, joints, field splices, and connections.
 6. Details of accessories.
 7. Details of moldings, removable stops, and glazing.
 8. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Verification:
 1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

- B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Smoke Door Assemblies
 - 1. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- D. ~~Fire-Rated, Borrowed Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.~~
- E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

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

1.7 COORDINATION

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

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
 - 1. CECO Door Products (C).
 - 2. Curries Company (CU).

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
 - 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 - 2. Manufacturers Basis of Design:
 - a. Curries Company (CU) - C Series.
- C. ~~Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire protection ratings indicated.~~
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.4 FRAME ANCHORS

A. Jamb Anchors:

1. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
2. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

2.5 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

2.6 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
3. Equal Rabbet Frames: Provide frames with equal rabbet dimensions unless glazing and removable stops require wider dimensions on glass side of frame.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
6. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
7. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
8. Jamb Anchors: Provide number and spacing of anchors as follows:

- a. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
- 9. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
- D. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.7 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.
- E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

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

- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 081113

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-rated access doors and frames.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches (150 by 150 mm) in size.

C. Product Schedule: For access doors and frames.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing and inspecting agency.

1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.

1.4 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

1.5 QUALITY ASSURANCE

A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies meets the qualifications set forth in NFPA 80, Section 5.2.3.1.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

2.2 FIRE-RATED ACCESS DOORS AND FRAMES

- A. Fire-Rated, Recessed Access Doors with Concealed Flanges:
 - 1. Description: Door face flush with frame, uninsulated; with concealed flange for CMU wall installation, self-closing door, and concealed hinge.
 - 2. Optional Features: Piano hinges and Masonry anchors
 - 3. Locations: Wall
 - 4. Door Size: 24-inches wide by 48-inches high
 - 5. Fire-Resistance Rating: Not less than 2 hours
 - 6. Metallic-Coated Steel Sheet for Door: Nominal 0.040 inch (1.02 mm), 20 gage factory finished.
 - 7. Frame Material: Same material, thickness, and finish as door
 - 8. Latch and Lock: Self-closing, self-latching door hardware, operated by knurled-knob, with interior release.
- B. Basis of Design:
 - 1. Best SKU: BAFW-5050 24x48 (610x1219) Fire-Rated Insulated Access Door. Best Access Doors, 228 Park Ave. S. #76520, New York, NY, 10003.

2.3 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: Same material as door face.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- D. Recessed Access Doors: Form face of panel to provide recess for clearance of operating hardware to existing covering access panel to remain. Reinforce panel as required to prevent buckling. Provide access sleeves for each latch operator and install in holes cut through finish.
- E. Latch and Lock Hardware:
 - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Factory Primed on Steel: Apply manufacturer's phosphate preparation with prime coat of white baked-on enamel.
 - 2. Final painting in field .

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Field verify size of existing rough opening in existing CMU fire rated wall.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
 - 1. Access door to be installed in existing CMU Wall.
 - 2. Remove and reinstall existing cover access panel and metal stud furred wall as necessary to install new fire-rated access panel.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 - 1. Fire-Rated Door Inspections: Inspect each fire-rated access door in accordance with NFPA 80, Section 5.2.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated access door indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 01 Section "General Conditions".
 - 2. Division 06 Section "Rough Carpentry".
 - 3. Division 06 Section "Finish Carpentry".
 - 4. Division 08 Section "Operations and Maintenance".
 - 5. Division 08 Section "Hollow Metal Door Frames".
 - 6. Division 08 Section "Flush Wood Doors".
 - 7. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
 - 8. Division 26 Section "Electrical"
- D. Codes and References: Comply with the version adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series.
 - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.

3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- D. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
- B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
- F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 1. Function of building, purpose of each area and degree of security required.

2. Plans for existing and future key system expansion.
 3. Requirements for key control storage and software.
 4. Installation of permanent keys, cylinder cores and software.
 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 3. Review sequence of operation narratives for each unique access controlled opening.
 4. Review and finalize construction schedule and verify availability of materials.
 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion. Individual hardware components shall carry manufacturer's minimum warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

2.2 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with 5 knuckle heavyweight Non-Removable Pin (NRP) ball bearing hinges and other options as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 - 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

- a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
- 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.
- 5. Manufacturers:
 - a. Hager Companies (HA)
 - b. McKinney (MK)
 - c. Lawrence Brothers (LA)

2.3 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
 - 1. Manufacturers:
 - a. ASSA ABLOY Accentra
 - b. Medeco (MC).
 - c. To Match Existing
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 - 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 - 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 - 4. Tubular deadlocks and other auxiliary locks.
 - 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 - 6. Keyway: Match Facility Standard.
- C. Small Format Interchangeable Cores: Provide small format interchangeable cores (SFIC) as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
 - 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.

2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide construction master keyed cylinders.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.4 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ML2000 Series.
 - b. To Match Existing

2.5 LOCK AND LATCH STRIKES

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

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.6 SURFACE DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.

1. Manufacturers:
 - a. UMB Comment: Provide LCN 4040XP manual closers.
 - b. Corbin Russwin Hardware (RU) - DC6000 Series.
 - c.
 - d. To Match Existing

2.7 ARCHITECTURAL TRIM AND ACCESSORIES

A. Door, Frame and Wall Protective Trim: ANSI/BHMA A156.6, protective products as specified in the hardware sets. Door protection plates shall be not more than 2" less than door width on stop side and 1" less door width on the pull side or on stop side of pairs of doors. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide protective trim with functions and features as follows:
 - a. Meets ADA requirements for smooth bottom door surfaces.
 - b. ~~UL Classified options for use on fire rated doors up to 3 hours.~~
 - c. Fabricated from stainless steel, brass, bronze, aluminum, or high-impact plastic.

- d. Available in a variety of sizes, finishes, and profiles to suit aesthetic and functional requirements.
- e. Designed to protect doors, frames, and adjacent walls from damage due to impact, abrasion, or traffic.
- f. Fasteners included; adhesive-backed options available for select models.
- g. Ten-year limited warranty.

2. Manufacturers:

- a. Hiawatha, Inc. (HI).
- b. Rockwood (RO).
- c. Trimco (TC).

2.8 DOOR STOPS AND HOLDERS

- A. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

- a. Hiawatha, Inc. (HI).
- b. Rockwood (RO).
- c. Trimco (TC).

2.9 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

- C. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

- D. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

E. Manufacturers:

1. National Guard Products (NG).

2. Pemko (PE).
3. Reese Enterprises, Inc. (RE).

2.10 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.11 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate

as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.
 - 2. The supplier is responsible for handing and sizing all products.
 - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 - 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Manufacturer's Abbreviations:
 - 1. MK - McKinney
 - 2. RU - Corbin Russwin
 - 3. MC - Medeco
 - 4. RO - Rockwood
 - 5. OT - Other

Hardware Sets

Set: 1.0

Doors: B1,B2

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Classroom Intruder Lock	ML2052 ASA CLS6	626	RU
2 Small Format Inter Core	33600006N	26	MC
1 Surface Closer	4040XP (TO SUIT)	689	LCN
1 Door Stop	403/441CU (TO SUIT)	US26D	RO

Notes:

- Perimeter/meeting stile seals by frame/door supplier. See floorplans for the direction of swing of the doors.

Set: 2.0

Doors: C1, C2, C3, C4, L1

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom Lock	ML2057 ASA CLS6	626	RU
1 Small Format Inter Core	33600006N	26	MC
1 Door Stop	403/441CU (TO SUIT)	US26D	RO
3 Silencer	608/609 (TO SUIT)		RO

Set: 3.0

Doors: S1, S2, S3

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom Lock	ML2057 ASA CLS6	626	RU
1 Small Format Inter Core	33600006N	26	MC
1 Surface Closer	4040XP (TO SUIT)	689	LCN
1 Kick Plate	K1050 10" CSK	US32D	RO
1 Door Stop	403/441CU (TO SUIT)	US26D	RO
3 Silencer	608/609 (TO SUIT)		RO

Set: 4.0

Doors: ~~D3.2~~

-

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Classroom Intruder Lock	ML2052 ASA CLS6	626	RU

2 Small Format Inter Core	33600006N	26	MC
1 Surface Closer	DC6200/DC6210 (TO SUIT)	689	RU
1 Kick Plate	K1050 10" CSK	US32D	RO
1 Door Stop	403/441CU (TO SUIT)	US26D	RO
3 Silencer	608/609 (TO SUIT)		RO

Set: 5.0

Doors: [R1](#), [R2](#), [R3](#), [R4](#)

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Privacy Lock	ML2060 ASA V21	626	RU
1 Surface Closer	4040XP (TO SUIT)	689	LCN
1 Kick Plate	K1050 10" CSK	US32D	RO
1 Mop Plate	K1050 4" CSK	US32D	RO
1 Door Stop	403/441CU (TO SUIT)	US26D	RO
3 Silencer	608/609 (TO SUIT)		RO
1 Coat Hook	RM802	US32D	RO

Set: 6.0

Doors: [A1](#), [A2](#), [A3](#), [A4](#), [D1](#), [D2](#), [D3](#), [O1](#), [O2](#), [O3](#), [O4](#)

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Passage Latch	ML2010 ASA	626	RU
1 Kick Plate	K1050 10" CSK	US32D	RO
1 Door Stop	403/441CU (TO SUIT)	US26D	RO
3 Silencer	608/609 (TO SUIT)		RO

Set: 7.0

~~Doors: 632, 648~~

-			
1 All Hardware	EXISTING TO REMAIN		OT

END OF SECTION 087100

SECTION 102800 – TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Framed mirror units.
3. Grab bars.

1.2 ACTION SUBMITTALS

- A. Product data.**
- B. Include construction details, material descriptions, dimension of individual components and profiles, and finishes.**
- C. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.**

1.3 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.**
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Design accessories and fasteners to comply with the following requirements:**
1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.
 2. Shower Seats: Installed units are able to resist 360 lbf concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Toilet Tissue (Roll) Dispenser <A>:

1. Product: Kimberly Clark; Cored JRT Jumbo Combo Tissue Dispenser, #09551 Smoke/Gray.
2. Capacity: Designed for 9- or 10-inch-diameter tissue rolls.
3. Material and Finish: ABS plastic housing, built-in anti-microbial protection, and Translucent front cover.
4. Refill indicator: Pierced slots at front.



B. Paper Towel (Roll) Dispenser for Public Restrooms :

1. Product: Kimberly Clark: Sanitouch #09990, Smoke Gray.
2. Dimensions: 12.63" x 16.13" x 10.2" deep.
3. Description: Pull-towel-actuated mechanism that permits controlled delivery of paper rolls in preset lengths.
4. Minimum Capacity: 8-inch-wide, 800-foot-long roll.
5. Lockset: Tumbler type.



C. Paper Towel (Roll) Dispenser for **Kitchenettes and Laboratory Sink** Areas: <C>

1. Product: Kimberly Clark: Sanitouch #09746, Smoke.
2. Dimensions: 10.5" x 10.0" x 10.0" deep.
3. Minimum Capacity: 8-inch-wide, 800-foot-long roll.
4. Lockset: Tumbler type.



D. Countertop-Mounted Circular Waste Chute <D>:

1. Product: Bobrick: Countertop-mounted circular waste chute, #529.
2. Outside Dimension: 6 inches.
3. Material and Finish: Stainless steel.

E. Waste Receptacle (listed for coordination with countertop-mounted waste chutes): Rubbermaid; Slim Jim Container #3540, supplied by Owner.

F. Soap Dispenser <E>: The University EVS will provide Classic Manual soap dispenser.

1. Description: Designed for operation and dispensing soap in liquid or lotion form.
 - a. EcoLab #92023091 NEXA Manual Compact Dispenser in Black.> <E>:
2. Mounting: Vertically oriented, surface mounted.
3. Capacity: 1250 ml.



G. Grab Bar <GB-LENGTH>:

1. Mounting: Flanges with concealed fasteners.

2. Material: Stainless steel, 0.05 inch thick.
3. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. OD: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings.

H. Mirror Unit <F>:

1. Product: Bobrick B-290
2. Frame: 304 Stainless steel angle, 0.05 inch thick, satin finish.
3. Welded corners, galvanized steel back.
4. Size: As indicated on Drawings.

2.3 FABRICATION

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.

END OF SECTION 102800

DIVISION 210000 – FIRE PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE:

- A. The fire protection contractor shall furnish all labor, material, tools, equipment and services necessary and incidental for installing all fire protection systems shown on the drawings, indicated in the specification, or necessary to provide a finished installation. The finished installation shall be in perfect working condition and be ready for continuous and satisfactory operation. The project area is located in the School of Nursing, Floor 6.

1.3 CODES AND REGULATIONS

- A. All materials furnished and all work installed shall comply with the codes and regulations adapted by the State of Maryland and recommendations of the following bodies:
 - 1. International Building Code (IBC)
 - 2. National Fire Protection Association (NFPA)
 - 3. Maryland State Fire Prevention Code

1.4 RESPONSIBILITY

- A. The Construction Manager/General Contractor (GC/CM) shall be responsible for all work included in this Division. The delegation of work to other contractors shall not relieve him of this responsibility. Contractors who perform work under this Division shall be responsible to the CM/GC.

1.5 SITE VISIT

- A. Prior to preparing the bid, the fire protection contractor shall visit the site and become familiar with all existing conditions. Make all necessary investigations as to locations of utilities and existing field conditions that could affect the work. No additional compensation will be made to the contractor as a result of his failure to familiarize himself with the existing conditions under which the work must be performed.

1.6 OUTAGES

- A. For all work requiring an outage, the fire protection contractor shall submit an outage request to the UMB Project Manager, using the UMB Standard Request for Outage Form which is available through the UMB Design and Construction Web Site at:
<https://www.umaryland.edu/designandconstruction/resources/contractors/>
- B. The existing mechanical/electrical/fire protection systems shall remain operational unless turned off by University personnel during the construction of the project.
- C. Unless otherwise specified, outages of any services required for the performance of this contract and affecting areas other than the immediate work area shall be scheduled at least ten business days (10) days in advance with the UMB Design and Construction Department. Outages shall be performed during normal duty hours. If necessary, some outage work may be performed outside normal hours if approved by UMB.
- D. All fire protection outages which will interfere with the normal use of the building in any manner shall be done at such times as shall be mutually agreed upon by the contractor and the UMB Design and Construction Department.
- E. The contractor shall include in his price the cost of all premium time required for outages and other work which interferes with the normal use of the building, which will be performed during other than normal work time and at the convenience of the University.
- F. The operation of fire protection valves required to achieve an outage must be operated by University personnel only. Unauthorized operation of fire protection valves or other control devices by contractors and their personnel will result in extremely serious consequences for which the contractor will be held accountable.

1.7 DESIGNER/INSTALLER QUALIFICATIONS

- A. Designer: Field survey, design, and preparation of the submittals required by the specifications shall be performed and certified by an individual who is a registered professional engineer or who is certified as a Level III or IV Technician by NICET in Water-Based Systems Layout. The designer shall have a minimum of five (5) years' experience in the preparation of sprinkler shop drawings, hydraulic calculations, and field surveying. The system designer shall sign (with certification/license number) each sheet included in the set of drawings.
- B. Installer: The field sprinkler foreman shall hold a current valid certification from a nationally recognized sprinkler apprenticeship school or government agency or be recognized as "Journey Level" by a local fire sprinkler labor union. The installing contractor shall be licensed in the State of Maryland.

1.8 SUBMITTALS

A. General: For general requirements see Architectural Specification Division 01 Section "Submittal Procedures". Also comply with the following:

1. UMB requires the Fire Protection Submittal to be submitted electronically as one (1) complete submission as a "pdf" file for review. Partial Submittals will be rejected.
 - a. The complete submittal must be reviewed and approved by the A/E and the UMB Fire Marshal before installation can take place.
 - b. The warranty information and maintenance manuals shall be included in the Project O & M Manual.
2. Submittal approval does not relieve the contractor of their responsibility to provide a code compliant system. Any installation by the contractor that does not meet code or specification requirements shall be corrected to be in full compliance at no cost to the University.
3. Fire protection shop drawings (working plans) must be developed by computer software. Fire protection shop drawings (working plans) submitted for review that are hand drawn or have handwritten notes will be rejected.
4. The sprinkler contractor shall not deviate from the approved sprinkler layout drawings unless written approval has been obtained from the UMB Fire Marshal.
5. Where deviations are approved by the UMB Fire Marshall or as necessary by field conditions, the contractor shall record on one (1) set of prints, the installed locations, sizes, and depths of pipes, services, equipment, etc. which may differ from the approved fire protection shop drawings (working plans). When the sprinkler work has been completed and accepted by UMB and all deviations have been recorded the sprinkler contractor shall scan the prints as a color pdf file.
6. Submittal approval does not relieve the contractor of their responsibility to provide a code compliant system. Any installation by the contractor that does not meet code or specification requirements shall be corrected to be in full compliance at no cost to the University.
7. Electronic Fire Protection Submittal: Fire protection submittal shall include the product data listed in paragraphs below. The complete submittal must be reviewed and approved by the A/E and the UMB Fire Marshal before installation can take place.
8. Product data shall include the following items unless otherwise noted
 - a. Article 2.4, Sprinkler System Pipe, Fittings, and Joints

- b. Article 2.6, Sprinklers
 - c. Article 2.7, Identification and Leak Testing
 - d. Article 2.8, Hangers and Supports
 - e. Article 2.9, As-Built Drawing Do not include this data in the Fire Protection Submittal.
 - f. Article 2.10, O & M Manuals Do not include this data in the Fire Protection Submittal.
 - g. Warranties and maintenance instructions shall be included in the O & M Manual only. Do not include this data in the Fire Protection Submittal.
9. Additional Data: Subject to project requirements, in addition to the product data indicated in the paragraph above the following additional data may be required:
- a. Fire Protection Shop Drawings (working plans)
10. Submittal File Format: File formats and names for each submittal shall be electronically as follows:
- a. File Formats:
 - 1) Product Data: “pdf” file format.
 - 2) Design Shop Drawings: “pdf” and “dwg” file formats.
 - 3) Coordinated Drawings: “pdf” or “dwg” file formats.
 - 4) Schedules: “xl” file format.
11. Aside from the electronic submission, fire protection shop drawings (working plans) must also be submitted as a full size hard copy to the UMB Fire Marshal. All requirements from the “Working Plans” Section of NFPA 13 must be met.

1.9 IDENTIFICATION BADGES

- A. Contractors must obtain photo identification cards for all employees who will be at the construction site. The University will charge the contractor \$25.00 for each badge as a deposit of which \$20.00 will be returned when the badge is returned. Lost photo I.D. card will cost \$25.00 for another replacement card. (The above charges are subject to change without notice.)

1.10 HAZARDOUS MATERIALS

- A. Identification and removal of hazardous materials (asbestos, lead paint, PCBs) is not part of this contract. If questionable material is encountered, notify the University Project Manager and the University Environmental Health and Safety Department in writing immediately. The University shall then arrange for investigation and possible abatement of the material. Contractor shall schedule his work to accommodate hazardous material removal by the Owner.

1.11 WARRANTY/GUARANTEE

- A. All materials, equipment, etc. provided by the general contractor and/or his subcontractors shall be warranted and guaranteed to be free from defects in workmanship and materials for a period of two (2) years from the date of substantial of completion and acceptance of work by UMB. Any defects in workmanship, materials, or performance which appear within the guarantee period shall be corrected by the contractor without cost to the owner, within a reasonable time, to be specified by UMB. In default thereof, owner may have such work done and charge the cost of same to the contractor.

PART 2 – PRODUCTS

2.1 LISTED MANUFACTURERS

- A. Listed Manufacturers: The manufacturers indicated in Part 2 represent the basis for design and identify the minimum level of quality for materials and equipment, specified in this Division, that are acceptable to UMB. Unless “or equal” is included as an option, substitutions are not allowed, except under the following condition. During bid phase, contractors may submit material and equipment by non-listed manufacturers provided said submittals meet the requirements of these specifications. All submitted materials and equipment are subject to approval by the A/E and UMB. Reference: Division 1 Substitution Section.

2.2 GENERAL REQUIREMENTS

- A. Sprinkler system design, installation and water supply requirements shall be designed to a minimum hazard classification of Ordinary Hazard (Group 1), unless otherwise approved by the UMB Fire Marshal.
- B. All modifications to existing sprinkler systems shall be performed in accordance with the edition of NFPA 13 which is applicable within the State of Maryland at the time of contract execution and as approved by the UMB Fire Marshal.
- C. The Contractor shall be responsible for replacing all products and material that were installed that were not included in the approved submittal.

2.3 SPRINKLER SYSTEM PIPE, FITTINGS, AND JOINTS

- A. General: All pipe, fillings, joints, and couplings used for standpipe and sprinkler systems shall be as follows:
 - 1. Piping: All piping shall be the product of one (1) manufacturer. Piping one (1) inch and larger shall be provided with antimicrobial coating to limit corrosion from

microbes on the interior of the pipe. Acceptable manufacturer for sprinkler piping is Wheatland Tube Company or approved domestic equal.

2. Fittings, Couplings and Gaskets: All grooved fittings, couplings and gaskets shall be the product of one (1) manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. Acceptable manufacturers for grooved fittings, couplings and gaskets are Victaulic or Gruvlok with Victaulic products as the basis of design.
 3. The Contractor shall be responsible for replacing all products and material that were installed and was not included in the approved submittal.
- B. Pipe Material: All piping shall be Grade A or Grade B, Schedule 40 black steel pipe manufactured in the United States as follows:
1. Piping one and one half (1-1/2) inch and smaller shall conform to Type 'F' Grade 'A' Schedule 40 black steel pipe per ASTM A53 with threaded ends. Threads shall be per ANSI B.1.20.1.
 2. All two (2) inch piping shall conform to Type 'E' Grade 'B' Schedule 40 black steel pipe per ASTM A53. Two (2) inch piping shall be either thread end type per paragraph 1 above or rolled grooved end type per paragraph 3 below. (Contractor Option)
 3. Piping two and one half (2-1/2) inch and larger shall conform to Type 'E' Grade 'B' Schedule 40 black steel pipe per ASTM A53 with rolled grooved ends.
- C. Fitting Material: Comply with the following:
1. Threaded Fittings: Fittings for piping one and one half (1-1/2) inch and smaller shall be threaded Class 125 cast iron fittings as manufactured by Anvil / ASC Engineered Solutions or approved domestic equal.
 2. Fitting Options: Fittings for two (2) inch piping shall be either threaded Class 125 cast iron per paragraph 1 above or ductile iron grooved end fittings per paragraph 3 below. (Contractor Option)
 3. Grooved Fittings: Fittings for piping two and one half (2-1/2) inches and larger shall be ductile iron grooved end fittings. Fittings shall be short pattern, with flow equal to standard pattern fittings.
- D. Joints, Couplings, Mechanical T's and Gaskets: Comply with the following:
1. Joints:

- a. Joints for piping one and one half (1-1/2) inch and smaller shall be Threaded Joints conforming to American Standard for Pipe Threads ANSI B2.1.
 - b. Joints for two (2) inch piping shall either be Threaded Joints per paragraph 'a' above or Rolled Groove Joints with Couplings per paragraph 'c' below. (Contractor Option)
 - c. Joints for piping two and one half (2-1/2) inch and larger shall be Rolled Groove Joints with Couplings.
2. Couplings:
- a. Couplings for rolled grooved piping shall be Victaulic Style 009N two (2) Bolt Installation Ready Coupling with offset angled bolt pads to accomplish rigidity and provide support in accordance with NFPA 13. Couplings shall be fully installed at visual pad to pad offset contact. Couplings that require gapping of bolt pads or specific torque ratings for proper installation are not permitted.
3. Mechanical-Ts:
- a. For piping smaller than 2", provide Victaulic FireLock Outlet-T Style 922.
 - b. For piping larger than 2", provide Victaulic Mechanical-T Bolded Branch Outlet Style 920.
 - c. For 2" piping, either the Victaulic FireLock Outlet-T Style 922 or Victaulic Mechanical-T Bolded Branch Outlet Style 920 is acceptable.
4. Gaskets: Gasket Material shall be as follows:
- a. Wet Systems: Grade 'EHP' EPDM.
 - b. Dry Systems: Grade 'E' Type 'A' EPDM.

2.4 SPRINKLERS

- A. General: Sprinklers shall be listed by UL and only new sprinklers shall be installed. Sprinklers shall be located and installed in accordance with NFPA 13 and properly coordinated with all other work.
- B. Damage to Sprinklers: Any sprinkler that incurs damage, is painted, sprayed, caulked, or covered with any material before the system is accepted by the University shall be replaced

by the contractor at no cost to the Owner. Protective sprinkler caps cannot be removed until after the ceiling is in place, or sprinklers will be subject to replacement.

- C. Basis of Design: The basis of design shall be sprinklers manufactured by Viking or others as permitted below.
- D. Temperature Ratings: The temperature rating of every sprinkler shall be in accordance with NFPA 13 and based upon the maximum anticipated ceiling temperature.
- E. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler. Guards shall be specifically listed for the sprinkler on which they are being installed. Guards shall be installed wherever sprinklers are potentially subject to damage. Guards shall be installed on all upright sprinklers located at the base of stairwells, on all sprinklers under ductwork, and on all sprinklers installed less than six (6) feet – eight (8) inches above the finished floor.
- F. Coverage: Except for high hazard areas, all sprinklers shall be quick response standard coverage type sprinklers with a 'K' Factor of 5.6, unless prohibited by Code or otherwise directed by the UMB Fire Marshal. Only the listed sprinklers below may be installed, unless specific project requirements dictate a different type of sprinkler:
 - 1. Pendant Sprinklers: Where pendant sprinklers are required, provide Viking VK3021 - Horizon Quick Response Flush Pendent Sprinkler and push on escutcheon with a white polyester finish to match ceiling.
 - 2. Upright Sprinklers: Where upright sprinklers are required, provide Viking VK3001 - Microfast Quick Response Upright Sprinkler with a chrome finish.
 - 3. If existing to remain sprinklers are present in the same compartment as new sprinklers, the existing sprinklers are not one of the models specified above, the new sprinklers shall match the type and style of the existing sprinklers.

2.5 IDENTIFICATION, & PIPE HYDROSTATIC/LEAK TESTING

- A. General: Provide all supports, identification, and hydrostatically leak testing for all piping systems indicated on the drawings, details and as specified below.
- B. Identification Products for Fire Protection Systems: Identification products for Fire Protection Systems shall include pipe labels and ceiling markers conforming to

ANSI/ASME A 13.1, OSHA and NFPA requirements for letter/color combinations from one (1) of the following manufacturers or approved equivalent as follows:

1. Seton Fire Protection Signage
 2. Craft Mark Fire Protection Signage
 3. Reliable
 4. Tyco
 5. Kroy
- C. Pipe Labels: Provide pretensioned, preformed semi-rigid vinyl or plastic pipe labels to partially cover circumference of pipe and to attach to pipe without adhesive.
1. Label Material: Comply with the following:
 - a. Vinyl Formed Labels:
 - 1) External diameters up to two (2) inches – 20 mil vinyl.
 - 2) External diameters up to two and one half (2-1/2) inches – 30 mil vinyl.
 - b. Plastic Formed Labels: per manufacturer's recommendations.
 2. Flow Direction Arrows: Integral with piping-system service lettering to accommodate both directions and as separate unit on each pipe label to indicate flow direction.
 3. Lettering Size:
 - a. Pipe Size Less Than One and One Half (1-1/2) Inch in Diameter: Label shall be at least three quarter (3/4) inches high.
 - b. Pipe Size One and One Half (1-1/2) Inch to Two Inch (2) in Diameter: Label shall be at least one and one half (1-1/2) inches high.
 - c. Pipe Size Two and One Half (2-1/2) Inch in Diameter and Larger: Label shall be at least two and one quarter (2-1/4) inches high.
 - d. Pipe-Label Colors:
 - 1) Background Color: Red.
 - 2) Letter Color: White.
 - 3) Lettering: (Wording for items B & C may need to be custom ordered)
 - a) "Fire Sprinkler"
 - b) "Dry Fire Sprinkler"

- c) “Pre-Action Fire Sprinkler”
- d) “Drain”
- e) “Standpipe”

D. Ceiling Grid and Access Panel Markers: Provide Kroy type clear adhesive printed labels with three sixteenth (3/16) inch high letters to identify the location and type of concealed valves and sprinkler system components.

1. Ceiling Marker Data: For Fire Protection printed data shall be as follows:

- a. FP Valve – Low Point Drain.

E. Pipe System Hydrostatic/Leak Test:

- 1. Perform hydrostatic testing in accordance with NFPA 13.

2.6 HANGERS AND SUPPORTS

- A. Provide hangers and supports in compliance with NFPA 13.

2.7 AS BUILT DRAWINGS

- A. For requirements see Part 3.

2.8 PROJECT OPERATION AND MAINTENANCE MANUAL ELECTRONIC FILES

- A. Project O & M Manual File: The project OM Manual shall include one (1) electronic copy of each approved submittal and any manufacturer’s maintenance manuals, and all warranty certificates included in this Division. Also include the address, phone number and contact person for each supplier. Using the UMB Standard O&M Manual Template referenced in Division 01 Closeout Procedures insert the submittal files include both a book mark and tree structure for accessing each submittal file in the manual.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. In no case shall the existing fire protection system be placed out of service for more than eight (8) hours in a twenty four (24) hour period without the written approval of the UMB Fire Marshal. Contractor shall be responsible for performing a fire watch for outages greater than eight (8) hours.
- B. Install all pipe, fittings, valves, controls, hangers and other components in accordance with NFPA 13.

- C. The work under this contract shall be coordinated with that of all trades so that all work may be installed in the most direct and workmanlike manner, and so that interference between piping, ducts, equipment, architectural and structural features will be avoided.
- D. All construction work that creates excessive noise will not be permitted during normal business hours. See Division 01 Specification Section “Cutting and Patching” for requirements.

3.2 CONNECTIONS AND ALTERATIONS TO EXISTING WORK

- A. When existing fire protection work is removed, all pipes, valves, fittings, etc. shall be removed back to the active mains and capped. Plug and remove existing piping at the last active sprinkler.
- B. Removal and/or relocation of existing services shall be closely coordinated with Facilities Management if they impact adjacent areas which shall remain operational.
- C. While performing connections and alterations to existing fire protection work, the contractor shall take extreme care to protect all existing materials, equipment, casework etc. from dirt, debris, and damage. Any damage caused by the contractor to existing materials, equipment, casework, etc. shall be repaired to UMB's satisfaction and specifications at the contractor's expense.

3.3 CUTTING AND PATCHING

- A. Cutting and patching associated with the work in the existing structure shall be performed a neat and workmanlike manner. Existing surfaces that are damaged by the contractor shall be repaired or provided with new materials to match existing.
- B. Structural members shall not be cut or penetrated. Holes cut through concrete and/or masonry to accommodate new work shall be cut by reciprocating or rotary, non-percussive methods.
- C. Patching of areas disturbed by installation of new work and/or required demolition shall match existing adjacent surfaces as to material, texture and color.

3.4 CUTTING, WELDING, BURNING

- A. Before the contractor and/or any sub-contractor commences any cutting, welding, burning or other type of hot work at UMB, the contractor must request a Hot Work Permit from the UMB Office of the Fire Marshal. Hot Work Permits must be requested online at <https://www.umaryland.edu/fire-marshal/hot-work-permits/> at least one (1) day before beginning hot work.

- B. The hot work permit copy shall remain on the job site at the hot work location until such work is completed.

3.5 PIPE SLEEVE INSTALLATIONS

- A. Non-Fire-Rated Soundproof Partition Penetrations: Where new and existing piping pass through interior partitions with sound proofing provide a pipe sleeves. Seal the annular spaces between construction openings, the sleeves, the pipe and/or pipe insulation with soundproof insulation material equal to the width of the opening. The soundproof insulation shall match the insulation in the partition

3.6 INSTALLATION – SPRINKLER PIPING

- A. In areas with suspended ceilings all sprinkler piping shall be concealed. Piping shall be installed and arranged to protect it from freezing and corrosion and shall be pitched for drainage.
- B. All sprinkler piping shall be substantially supported from the building structure which must support the added load of water filled pipe plus a minimum of two hundred fifty (250) pounds applied at the point of hanging in accordance with NFPA 13.
- C. Install all vertical sprinkler piping systems level and parallel to the building walls, ceilings, and partitions.
- D. Sprinkler Main and Branch Piping: All new sprinkler main and branch piping shall comply with the following:
 - 1. All new sprinkler main and branch piping shall be installed level and parallel to walls, matching work by other trades.
 - 2. Where horizontal sprinkler piping offsets to clear obstructions such as ductwork, structural members and work installed by other trades provide low point drain valves in locations where they can be accessed.
- E. Pipe and Connections for Sprinklers: Sprinkler Pipe and connections for Sprinklers shall comply with the following requirements:
 - 1. When reusing existing sprinkler branch piping, the sprinkler pipe runout connections located on the bottom of the existing branch piping are permitted to be reused when relocating sprinklers. Return bends are not required for new sprinkler runout piping.
 - 2. Mechanical T-s in new piping and/or added to existing sprinkler piping must be made with the outlet on the top or side of the piping.
 - 3. All new sprinkler branch piping must be connected to the top or side of the existing or new sprinkler main.

4. All new sprinkler runout pipe connections serving individual sprinklers must be made off the top or side of the sprinkler branch piping unless otherwise noted above.
 5. Sprinkler Runout Piping – Existing Branch Piping: New sprinkler runout pipes connecting to existing branch piping can be installed diagonally to or perpendicular to the existing branch piping.
 6. Sprinkler Runout Piping – New Branch Piping: New sprinkler runout pipes connecting to new branch piping shall be installed perpendicular to the new branch piping.
- F. Drains: All risers, including the alarm check valve, shall be equipped with drains sized as specified in NFPA 13. The alarm check valve drain (main drain) shall be piped to the outside of the building or to a Storm Water Sump with Pumps approved for the purpose by the Engineer and the UMB Fire Marshall. A supplementary drain of equal size shall then be provided for test purposes with free discharge, located at or above grade. An extra valve shall be installed in the line to the sump in order to close the line during tests.

3.7 PIPE JOINTS

- A. Grooved Joints: Install in accordance with the manufacturer's latest published installation instructions. Pipe ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to (and including) groove. Gasket shall be manufactured by the coupling manufacturer and verified as suitable for the intended service. A factory trained representative (direct employee) of the coupling manufacturer shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and product installation. The representative shall periodically visit the job site and review installation to ensure best practices in grooved joint installation are being followed. Contractor shall remove and replace any improperly installed products.

3.8 INSTALLATION – SPRINKLERS

- A. Center sprinklers in ceiling tiles and coordinate location with all other trades, including but not limited to ceilings, lights, diffusers, grilles etc.
- B. In finished areas where more than two (2) sprinklers are installed, the deflectors of all sprinklers shall be installed at the same elevation from the finished floor.
- C. New Sprinklers shall be installed using new rigid pipe for the sprinkler runout piping. See paragraph 3.6 for piping requirements

3.9 INSTALLATION – PIPE LABELS

- A. Install or permanently fasten labels on each major item of sprinkler equipment.

- B. Clean piping and equipment surface of substances that could impair bond of identification devices which may include dirt, oil, grease, release agents, incompatible primers, paints, and encapsulants.
- C. Pipe Labels: Provide pipe labels for all exposed and concealed piping. Locate pipe labels as follows:
 - 1. In spaces without ceilings position pipe labels so they are visible from the floor.
 - 2. In concealed spaces above suspended ceilings and in utility shafts position pipe labels so they are visible from an access point.
 - 3. Spaced at maximum intervals of twenty five (25) feet along each run of the sprinkler main.
 - 4. Near the midpoint of each branch pipe serving more than one (1) sprinkler.
- D. Piping Color Coding: Where indicated painting of fire protection piping shall follow the requirements in Architectural Specification Sections for “Interior Painting” and/or “High Performance Coatings”.

3.10 INSTALLATION, TEST AND ACCEPTANCE

- A. Installation, Tests, And Acceptance:
 - 1. Installation, testing, and final acceptance shall be in accordance with all applicable codes, and the requirements of the University and the UMB Fire Marshal.
 - 2. All required test shall be performed by the fire protection contractor as part of this contract. The fire protection contractor shall see those proper representatives of the Owner, the Engineer, UMB Fire Marshal, Design and Construction Department and any other personnel desiring to witness the tests shall be notified at least five (5) days prior to the scheduled test time.

3.11 CONSTRUCTION RECORD DOCUMENTS

- A. Upon completion of the work, the sprinkler contractor shall transmit to the A/E one (1) set of marked up prints as a colored pdf file and one (1) electronic CAD file in the latest Auto Cad Release edition used by UMB with All "As Built Drawing" information neatly recorded thereon in red. The A/E shall verify that all “Record Drawing” information has been recorded on the electronic CAD file. The electronic CAD file and mark up pdf file shall be transmitted to UMB by the A/E.
- B. At a minimum, the following installed conditions shall be recorded:
 - 1. Location of all low point drain valves with assigned valve tag numbers.

3.12 CLEAN – UP

- A. Excessive debris and dirt, such as occurs from cutting through masonry or plaster walls shall be cleaned up from the equipment and removed immediately after the work of cutting through the walls.
- B. Debris shall be removed from UMB property.
- C. Ceiling Tiles: Ceiling tiles in finished areas shall not be installed/replaced until all inspections have been completed and accepted.
- D. All areas shall be left broom-clean at the end of the work period.

3.13 COMPLETED HYDROSTATIC/LEAK TEST FORMS

- A. Upon completion of each hydrostatic/leak test, the contractor shall upload the signed leak test forms to the Project File, in ebuilder, in Folder 11.06 Test Reports.

3.14 UMB STANDARD HYDROSTATIC/LEAK TEST SUMMARY FORMS

- A. General: Contractor shall use the “UMB Standard Pipe System Hydrostatic/Leak Test Summary Form.”
 - 1. Sample Form: The following page contains a sample of the UMB Standard Pipe System_Hydrostatic/Leak Test Summary Form.
 - 2. Availability: The standard test summary form is available on the UMB Web Site at:
<https://www.umaryland.edu/designandconstruction/resources/contractors/>
 - 3. Field Testing: For field testing download and copy the forms from the UMB web site.

UMB STANDARD PIPE SYSTEM HYDROSTATIC/LEAK TEST SUMMARY FORM

TEST DATA:

Date: _____ Project Number: _____

Location: _____

Pipe System Tested (Service): _____

Location and Description: _____

Pipe Materials: _____

Operating Pressure: _____

Specified Test Pressure: _____

Actual Test Pressure: _____

Pressure Test Type: _____

Test Start Time: _____ Recorded Test Pressure: _____

Test Completion Time: _____ Recorded Test Pressure: _____

Test Duration: _____ Pressure Drop or Rise: _____

Test Result (Pass/Fail): _____

SIGNATURES:

Construction Manager: _____

Construction Manager Representative: _____

Mechanical Contractor: _____

Mechanical Contractor Forman: _____

UMB Division: _____

UMB Witness: _____

Remarks: _____

END OF DIVISION 210000

DIVISION 220000 – PLUMBING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE:

- A. The plumbing contractor shall furnish all labor, material, tools, equipment and services necessary and incidental for installing all plumbing systems shown on the drawings, indicated in the specification, or necessary to provide a finished installation. The finished installation shall be in perfect working condition and be ready for continuous and satisfactory operation. The project area is located on the sixth floor of the School of Nursing building, 655 W. Lombard St, Baltimore, MD 21201.

1.3 CODES AND REGULATIONS

- A. All materials furnished and all work installed shall comply with the codes and regulations adapted by the State of Maryland and recommendations of the following bodies:
 - 1. International Building Code (IBC)
 - 2. International Mechanical Code (IMC)
 - 3. International Plumbing Code (IPC)
 - 4. National Electric Code (NEC)
 - 5. Maryland State Health Department
 - 6. Underwriters Laboratories (UL)

1.4 RESPONSIBILITY

- A. The Construction Manager/General Contractor (CM/GC) shall be responsible for all work included in this Division. The delegation of work to the contractors shall not relieve him of this responsibility. Contractors who perform work under this Division shall be responsible to the CM/GC.

1.5 SITE VISIT

- A. Prior to preparing the bid, the mechanical subcontractor shall visit the site and become familiar with all existing conditions. Make all necessary investigations as to locations of utilities and existing field conditions that could affect the work. No additional compensation will be made to the contractor as a result of his failure to familiarize himself with the existing conditions under which the work must be performed.

1.6 OUTAGES

- A. For all work requiring an outage, the plumbing contractor shall submit an outage request to the UMB Project Manager, using the UMB Standard Request for Outage Form which is available through the UMB Design and Construction Web Site at:
<https://www.umaryland.edu/designandconstruction/resources/contractors/>
- B. The existing mechanical/electrical/fire protection systems shall remain operational unless turned off by University personnel during the construction of the project.
- C. Unless otherwise specified, outages of any services required for the performance of this contract and affecting areas other than the immediate work area shall be scheduled at least ten business days (10) days in advance with the UMB Design and Construction Department. Outages shall be performed during normal duty hours. If necessary, some outage work may be performed outside normal hours if approved by UMB.
- D. All plumbing outages which will interfere with the normal use of the building in any manner shall be done at such times as shall be mutually agreed upon by the contractor and the UMB Design and Construction Department.
- E. The plumbing contractor shall include in his price the cost of all premium time required for outages and other work which interferes with the normal use of the building, which will be performed, in most cases, during other than normal work time and at the convenience of the University.
- F. The operation of plumbing valves or switches; required to achieve an outage must be operated by University personnel only. Unauthorized operation of plumbing valves, power switches, or other control devices by contractors and their personnel will result in extremely serious consequences for which the contractor will be held accountable.

1.7 SUBMITTALS

- A. General: For general requirements see Architectural Specification Division 01 Section "Submittal Procedures". Also comply with the following:
 - 1. UMB requires all that all submittals, which includes shop drawings, product data, related equipment maintenance manuals, warranty documentation and all other pertinent information be submitted electronically by the manufacturer, trade contractors, and construction manager as a "pdf" file for review as required by Division 01. Partial submittals are not acceptable and will be returned without review.
 - 2. After contract award and before material is ordered submit electrically all product data, shop drawings and other such descriptive data as the Engineer may require to

demonstrate compliance with the contract documents as required by the contract clauses for review and approval.

3. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable publication references, years of satisfactory service, and other information necessary to establish contract compliance of each item the Contractor proposes to furnish.
4. Plumbing shop drawings must be developed by computer software. Any hand drawn shop drawings will be rejected and will not be reviewed.
5. Submittals will be reviewed for general compliance with design concept in accordance with contract documents, but dimensions, quantities, or other details will not be verified.
6. Product Submittals shall include the following items unless otherwise noted:
 - a. Article 2.2, Fire Stops & Smoke Seals for Wall and Floor Sleeve Applications
 - b. Article 2.3, Plumbing Piping Systems
 - c. Article 2.4, Pipe Sleeves
 - d. Article 2.5, Piping Specialties
 - e. Article 2.6, Plumbing Valves
 - f. Article 2.7, Hangers and Supports
 - g. Article 2.8, Identification System
 - h. Article 2.9, Plumbing Fixtures
 - i. Article 2.10, Plumbing Specialties
 - j. Article 2.11, Pipe Insulation
 - k. Article 2.12, Flushing and Disinfecting
 - l. Article 2.13, O&M Manual
 - m. Warranties and maintenance instructions shall be included in the O & M Manual only. Do not include this data in the Product Submittals.
7. Additional Data: Subject to project requirements, in addition to the product data indicated in the paragraph above the following additional data may be required:
 - a. Coordinated drawings
 - b. Samples
8. Submittal File Format: File formats and names for each submittal shall be electronically as follows:
 - a. File Formats:
 - 1) Product Data: “pdf” file format.
 - 2) Design Shop Drawings: “pdf” and “dwg” file formats.
 - 3) Coordinated Drawings: “pdf” or “dwg” file formats.

- 4) Schedules: “xl” file format.

1.8 SAMPLES

- A. Samples of materials to be used on the work shall be submitted when requested and shall be subject to approval by the A/E and the UMB Design and Construction Department.

1.9 IDENTIFICATION BADGES

- A. Contractors must obtain photo identification cards for all employees who will be at the construction site. The University will charge the contractor \$25.00 for each badge as a deposit of which \$20.00 will be returned when the badge is returned. Lost photo I.D. card will cost \$25.00 for another replacement card. (The above charges are subject to change without notice.)

1.10 HAZARDOUS MATERIALS

- A. Identification and removal of hazardous materials (asbestos, lead paint, PCBs) is not part of this contract. If questionable material is encountered, notify the University Project Manager and the University Environmental Health and Safety in writing immediately. The University shall then arrange for investigation and possible abatement of the material. Contractor shall schedule his work to accommodate hazardous material removal by the Owner.

1.11 FUNCTIONAL TESTING OF NEW PLUMBING SYSTEMS

- A. Summary: This article includes the requirements for functional testing of new Plumbing Systems, assemblies and equipment related to the project area.
- B. Functional Testing will be performed by UMB staff.
- C. Description: The following equipment and/or accessories shall be tested as part of this project:

1. Plumbing Systems:

- a. Plumbing Fixtures:
- 1) Water closets
 - 2) Lavatories.
 - 3) Countertop sinks.
 - 4) Floor Drains.
 - 5) Bath Tub / Showers
 - 6) Trap Primer

1.12 WARRANTY/GUARANTEE

- A. All materials, equipment, etc. provided by the general contractor and/or his subcontractors shall be warranted and guaranteed to be free from defects in workmanship and materials for a period of two (2) years from the date of substantial of completion and acceptance of work by UMB. Any defects in workmanship, materials, or performance which appear within the guarantee period shall be corrected by the contractor without cost to the owner, within a reasonable time, to be specified by UMB. In default thereof, owner may have such work done and charge the cost of same to the contractor. In addition to the above statement the Warranty/Guarantee Period shall also include all labor cost related to all warranty work.

PART 2 – PRODUCTS

2.1 LISTED MANUFACTURERS

- A. Listed Manufacturers: The manufacturers indicated in Part 2 represent the basis for design and identify the minimum level of quality for materials and equipment, specified in this Division, that are acceptable to UMB. Unless “or equal” is included as an option, substitutions are not allowed, except under the following condition. During bid phase, contractors may submit material and equipment by non-listed manufacturers provided said submittals meet the requirements of these specifications. All submitted materials and equipment are subject to approval by the A/E and UMB. Reference: Division 1 Substitution Section.

2.2 FIRE STOPS & SMOKE SEALS FOR WALL & FLOOR SLEEVE APPLICATIONS

- A. General: Provide fire stops, and smoke sealant materials for all plumbing services penetrating through rated assemblies. See Architectural Specification Division 07, Section “Penetration Firestopping” for sealant material requirements. Services include:
 - 1. Plumbing penetrations include all plumbing piping systems.
- B. New Construction: All new penetrations shall be provided with a pipe sleeve and sealant materials.
- C. Existing Construction: All new service penetrations through existing rated assemblies shall be provided with a pipe sleeve and sealant materials. All existing unsealed penetrations for services passing through existing rated assemblies within the project area shall be provided with sealant materials.
- D. Project Area: The project area shall include the finished spaces and related sections of the utility shafts within the project area footprint.

- E. Wall Pipe Sleeve Applications: Pipe sleeves shall be required for all new pipe penetrations through rated wall assemblies and non-rated CMU walls. Where pipe sleeves are installed in non-rated CMU walls fire rated sealant materials are not required. Provide acoustical caulking to seal the annular spaces between the sleeve and the bare pipe or pipe insulation on each end with one half (1/2) inch caulking all around the annular space.
- F. Floor Pipe Sleeves Applications: Pipe sleeves are required for all new pipe risers passing through floor slabs.

2.3 PLUMBING PIPING SYSTEMS

- A. General: Provide all piping systems indicated on the drawings and as specified below, including all labor materials and equipment necessary for a complete installation.
- B. Plumbing Piping Systems: Plumbing piping systems includes sanitary and vent, and domestic water piping systems as follows:

- 1. Sanitary & Vent Piping System: Pipe, fittings and couplings shall be as follows:

- a. Sanitary & Vent Piping Above Ground Inside the Building: Pipe and Fittings: Sanitary & vent piping shall be Schedule 40 cast iron no hub pipe and fittings. All Cast Iron Soil Pipe and Fittings shall be marked with the Collective Trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.
- b. Pipe Couplings: comply with the following:
 - 1) Husky SD 4000 Couplings: All couplings shall be a heavy-duty, all stainless steel coupling to join No-Hub pipe and fittings as engineered by Anaco. Each coupling shall include a super-duty corrugated shield of sufficient width to accommodate additional surface-bearing sealing clamps. All SD 4000 couplings shall be designed to be installed with a pre-set torque wrench calibrated at eighty (80) inch pounds to accommodate the 305 stainless steel three eights (3/8) inch Hex Head screws.
 - 2) Waste and Vent Pipe Sizes One and One Half (1-1/2) Inch Through Four (4) Inch: The one and one half (1-1/2) inch through four (4) inch diameter couplings shall consist of three (3) inch wide corrugated 304 stainless steel shield in conjunction with four (4) stainless steel clamps, secured in place by means of an affixed and “floating” eyelet to allow clamp “travel” during tightening.

- c. Material Specifications:
 - 1) Clamp: Type 304 AISI stainless steel
 - 2) Screw: Type 305 AISI stainless steel 3/8 inch screws
 - 3) Shield: Type 304 AISI stainless steel, corrugated. Shield thickness 0.015
 - 4) Gasket: The gasket shall be manufactured from a properly vulcanized virgin compound in which the primary elastomer is polychloroprene (neoprene) conforming to ASTM C 564. Oil Immersion test: 80% max. Volume Change after immersion in IRM 903 for seventy (70) hours at 212° F.
 - d. Certifications & Standards: Tested & Certified to:
 - 1) ASTM C1540
 - 2) ASTM C564
 - 3) FM 1680 Class 1
2. Domestic Water Piping Systems: Domestic water systems include cold, hot, and hot water return piping systems. Pipe, fittings and joints shall be as follows:
- a. Solder Connection: Heating water piping two (2) inch and smaller shall be type 'L' copper tubing assembled with wrought copper fittings and 95-5 solder.
 - b. Press End Connection: Domestic water piping two (2) inch and smaller shall be type 'L' copper tubing assembled with Viega ProPress copper fittings with EPDM seals and press connection with EPDM seals. (Contractors Option)

2.4 PIPE SLEEVES

- A. Steel Pipe Sleeves: Steel pipe sleeves shall be standard black steel pipe Type E, Grade B, with plain ends conforming to ASTM A53/A53M.
- B. Cast Iron Pipe Sleeves: Cast iron pipe sleeves shall be standard weight cast iron pipe with plain ends conforming to ASTM A74 and CISPI – 301.

2.5 PIPING SPECIALTIES

- A. General: Provide all piping specialties were indicated on the drawings, details, and as specified below complete with all supports, fittings, etc. for Plumbing Piping Systems.

1. Dielectric Connections: Provide dielectric connections where nonferrous metal is joined to ferrous metal as follows:
 - a. Piping Two (2) Inch and Smaller: Provide Schedule 40 unlined type 316 stainless steel nipples, four (4) inched long with thread ends.

2.6 PLUMBING VALVES

- A. Shut Off, Drain and Specialty Valves: All Shut Off, Drain and Specialty Valves installed in Plumbing Piping Systems shall be as specified below. Gate Vales will not be permitted for installation in these systems. All valves labeled as lead free (LF) shall be Lead Free Certified per NSF/ANSI 61 and NSF/ANSI 372. Only listed manufacturers and model numbers below are acceptable to UMB.

1. Shut Off Valves for Domestic Solder Joint Piping Systems:
 - a. Piping Systems One Half (1/2) Inch to Two (2) Inch: All valves used for shutoff duty shall be two (2) piece full port (FP) lead free ball valves with brass or bronze valve body with threaded end connections, solid tunnel bore 316 stainless steel ball and stem, RPTFE seats and seals, and valve lever type handle. Valve model numbers shall be as listed below:

Apollo: 77FLF-140* Series, Brass Body. (FP)
Milwaukee: UPBA400S* Series, Bronze Body. (FP)
Watts: LFB6080G2-SS*, Brass Body. (FP)

*Provide stem extensions on valves where pipe insulation affects the operation of the valve handle.

2. Shut Off Valves for Domestic Water ProPress (Press End) Piping Systems: (Contractor Option)
 - a. Piping Systems One Half (1/2) Inch to Two (2) Inch: All valves used for shutoff duty shall be two (2) piece full (FP) port lead free ball valves with brass or bronze valve body with press end smart connections, solid tunnel bore 316 stainless steel vented ball and stem, EPDM or PTFE seats and seals, and valve lever type handle. Valve model numbers shall be as listed below:

Viega: 2971.3ZL, Bronze Body*
Apolloxpress 77WLF-140*, Bronze Body
Milwaukee: UPBA480S*, Brass Body

*Provide stem extensions on valves where pipe insulation affects the

operation of the valve handle.

3. Drain and Specialty Valves for Domestic Water Piping Systems:

- a. Drain Valves for Piping Systems One Half (1/2) Inch to Two (2) Inch: All valves used as low point drains or for system drain down duty shall be three quarter (3/4) inch two (2) piece full port (FP) lead free valves ball with brass or bronze valve body with threaded end connections, solid tunnel bore 316 stainless steel ball and stem, RPTFE seats and seals, valve lever type handle and three quarter (3/4) inch capped hosed connection. Valve model numbers shall be as listed below:

Apollo: 77FLF-140* Series, Brass Body. (FP)

Milwaukee: UPBA400S* Series, Bronze Body. (FP)

Watts: LFB6080G2-SS*, Brass Body. (FP)

*Provide stem extensions on valves where pipe insulation affects the operation of the valve handle.

2.7 HANGERS & SUPPORTS

- A. General: Provide all supports, identification, and testing for all piping systems indicated on the drawings, details and as specified below.

B. Interior Pipe System Hangers & Supports:

1. Hangers and supports shall be provided for all piping systems, as recommended by the hanger manufacturers for the existing structural elements. On piping systems requiring insulation, hangers and supports shall be installed external to the insulation material, and sheet metal saddles shall be provided. Hangers and supports shall be provided at all changes of direction and elevations on piping system. Spacing shall be as recommended by manufacturer, for each pipe size and material.
2. Hangers, Supports, and Components: Provide factory fabricated products according to MSS SP-58 as manufactured by B-Line, Fee and Mason, ITT Grinnel, Pipe Shields, Inc., Michigan Hanger, and Unistrut. Unless otherwise indicated, specified model numbers are manufactured by B-Line.
3. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.
4. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

5. Thermal Hanger Shield Inserts: 100-psi (690kPa) average compressive strength, waterproofed calcium silicate or treated lumber inserts, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.
6. Horizontal Non-Insulated Waste and Vent Piping Hangers:
 - a. Two (2) inch and smaller: Figure No. B3170.
 - b. Two and one-half (2-1/2) inch and larger: Figure No. B3100.
7. Insulated Horizontal Piping Hangers: Cold and Hot Water (Domestic):
 - a. Two (2) inch and smaller: Figure No. B3108, with metal shield, Figure No. B3151.

2.8 IDENTIFICATION SYSTEM

- A. General Requirements: Do not use pipe labels or plastic tapes for bare pipes conveying fluids at temperatures of 125°F (52°C) or higher.
- B. Identification Products for Plumbing Systems: Identification products for Plumbing Systems shall include pipe markers, duct markers, valve tags and ceiling markers conforming to ANSI/ASME A 13.1 & OSHA requirements for letter/color combinations and as follows:
 1. Pipe Labels: Provide pretensioned, preformed semi-rigid vinyl or plastic pipe labels with flow arrows to partially cover or cover full circumference of pipe and to attach to pipe without adhesive. Pipe labels shall be SETMARK System as manufactured by Seton Name Plate Corporation or approved equal.
 - a. Label Material: Comply with the following:
 - 1) Vinyl Formed Labels:
 - a) External diameters up to two (2) inches – 20 mil vinyl.
 - 2) Plastic Formed Labels: per manufacturer's recommendations.
 - b. Label Contents: Text with Field/Letters color as noted below:
 - 1) "SANITARY" – Green/White
 - 2) "VENT" – Green/White
 - 3) "DOMESTIC COLD WATER" – Blue/White
 - 4) "DOMESTIC HOT WATER" – Blue/White
 2. Valve Tags:

- a. Description: Stamped or engraved with one quarter (1/4) inch letters for piping system abbreviation and one half (1/2) inch numbers with:
 - 1) Brass Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2) Fasteners: Brass wire-link chain.
 - 3) Astric ((*): Indicates the valve is part of a renovation project in the building.
- b. Plumbing: Service – Tag Data:
 - 1) Domestic Cold Water – *DCW
 - 2) Domestic Hot Water – *DHW
3. Ceiling Markers: Ceiling Grid and Access Panel Markers: Provide Kroy type clear adhesive printed labels with three sixteenth (3/16) inch high letters to identify the location of concealed valves and equipment.
 - a. Ceiling Marker Data: For Plumbing Systems include:
 - 1) System Valves: Identify as follows:
 - a) Domestic Cold Water – “Plumbing Valve – HWRS”
 - b) Domestic Hot Water – “Plumbing Valve – HWRR”
 - c) Plumbing Low Point Drains – “Plumbing LPD – (*)”
(* = DCW, DHW)
 - 2) Miscellaneous Items: Identify as follows:
 - a) Sanitary Waste Cleanout – “SANCO”

2.9 PLUMBING FIXTURES

A. General:

1. Provide all plumbing fixtures and specialties indicated on the drawings and as specified below, complete with all trim, hangers, fittings etc. for a complete installation. All exposed metal parts shall be polished chrome plated brass unless otherwise specified below.
2. All plumbing fixtures & trim shall be as specified or approval equal.

B. Plumbing Fixtures:

1. WC-1 Water Closet - Flush Tank - ADA Compliant: Floor mounted vitreous china toilet for handicapped and elderly, elongated wash down bowl, closed coupled flushometer tank. Top of seat shall be 18" above finished floor. Tank shall be dual flush: full flush – 1.28 GPF, partial flush – 0.9 GPF; 2 bolt caps with open front seat less cover. American Standard “H2Otion ADA Dual Flush Right Height Elongated Toilet” or equivalent.
2. L-1 Countertop Lavatory: American Standard Aqualyn 0475.047 white vitreous china self rimming countertop lavatory, faucet ledge with 3 holes at 4 inch (4”) centers, front over flow, mounting kit, and fitted with a centerset bathroom sink faucet with wristblade lever handles, one piece brass construction, brass valve bodies and chrome finish. Kohler Triton Bowe K-400T20 or approved equal. Provide with hot and cold water supplies, chrome strainer, one and one-half (1-1/2) inch cast brass 'P' trap with cleanout, three eights (3/8) inch supply stops with lead free angle valves and wall type escutcheon plates for supply stops and drain.
3. S-1 Countertop Sink: Just Model ##LLQ-17519-B-GR, single compartment, stainless steel countertop sinks with overall dimension of 17 1/2 inches wide x 19 inches long with a 11 1/2 inch wide x 16 inch long x 6 inch deep bowl and a faucet ledge with faucet holes punched on eight (8) inch centers. Each sink shall be fitted with the hardware specified below. All sink hardware shall be as manufactured by Chicago Faucet, T&S Brass, Bradley, Speakman, or Plastic Piping System (PPS). Model #s listed below are for Chicago Faucet, Bradley & PPS.

Countertop Sink Hardware:

Faucet Assembly - #786-GN2FC319ABCP rigid/swing gooseneck spout, wrist blade handles, eight (8) inch centers, chrome finish with aerator, by Chicago Faucet.

Supply Stops - #10/8 three eight (3/8) inch supply risers twelve (12) inches long with three eight (3/8) inch lead free angle valves with wheel handle.

P-Trap & Drain - Acid waste drain #W1021, one and one-half (1-1/2) inch P trap with #W301 threaded sink outlet, by PPS.

4. BT-1 Shower/Bathtub (Wall Mounted, Concealed Supplies, Thermostatic Valve): 60" (1524 mm) x 30" (768 mm) x 15" (381 mm) straight front, recessed, 72" (1892 mm) overall surround height. Fiberglass or similar material (eg. Kohler Vikrell), slip resistant, all exposed trim chrome plated

surface, glazed tile appearance. Stainless steel grab bars and handicap seat compliant with ADA. Sterling model #: 71140115 or approved equal.

NAHB Label: Provide fiberglass bath tub units and shower stalls which have been tested and labeled by NAHB Research Foundation Inc.

Shower Installation: Wall mounted shower head with integral back secured to wall. Diverter shall be integral with single mixing valve. Tub spout shall be copper alloy.

Shower Heads: Chrome plated metal head, institutional type, removable handshower, self-cleaning head with automatic flow control device to limit discharge to not more than 2 gpm (.13 L/s). Provide vertical slide bar mounting of the handshower dock and vandal-proof screws. Body, internal parts of shower head, and flow control fittings shall be copper alloy or CRS. Install shower head 72 inches (1.8 m) above finished floor. Kohler, Awaken G90 or approved equal.

Valves: Thermostatic type T/P combination temperature and pressure balancing. Valve body shall be any suitable copper alloy. Internal parts shall be copper, nickel alloy, CRS or thermoplastic material. Valve inlet and outlet shall be 1/2-inch (13 mm) IPS. Provide external combination screwdriver check stops, and temperature limit stops. Set stops for a maximum temperature of 105°F (40°C). One piece chrome plated brass or CRS face plate, with chrome plated metal lever handle with adjustment for rough-in variation. Exposed fasteners shall be vandal resistant. Valve shall provide minimum of 6 gpm (9.4 L/s) at 45 psi (310 kPa) gage pressure drop.

Drain: Pop-up, 1-1/2" (40 mm) cup strainer, washers, couplings, trip lever, stopper, fittings, etc. shall be brass, cast copper alloy or cast brass.

Controls: Must be located adjacent to the entrance and are required to be above 38" (950 mm) but no higher than 48" (1200 mm) from the floor. Shower sprayers must have both fixed and hand-held use capabilities, with a 60" (1500 mm) flexible hose. Controls require activation pressures not exceeding five pounds (34 kPa) of force nor requiring tight grasping, pinching or twisting of the wrist.

2.10 PLUMBING SPECIALTIES

A. Floor Drains: Floor drains shall be as manufactured by Zurn, Josam, Wade or approved equal as follows:

1. Toilet Rooms: Zurn floor drain Z-415, dura coated cast iron body with no hub type, two (2) inch outlet, combination invertible membrane clamps, adjustable type 'B' six (6) inch diameter nickel bronze strainer, trap primer connection located in the outlet pipe and a no hub type deep seal trap. See drawings and details for pipe size. Trap primer connections located in the drain body are not permitted.

2. Where indicated on the drawings provide a connection for a trap primer line. The trap primer connection shall be located in the floor drain discharge pipe. Trap primer connections located in the body of the drain are not acceptable.

B. Trap Primers: For floor drains connected to sanitary piping provide trap primers as follows:

1. TPS-1 Electric Trap Priming Station: Prime the floor drain trap using an automatic priming system similar to Precision Plumbing Products Smart Prime 500-115V electric trap priming system complete with, one half (1/2) inch copper inlet connection, stainless steel solenoid valve, 1" physical air gap, manual override/ test button, copper water way, with a single 1/2" Female NPT connection to deliver a six (6) second water injection every twenty four (24) hours.

C. Cleanouts:

1. General: Provide cleanouts in drainage piping were indicated on the drawings and where required by code, cleanouts shall be same size as pipe in which they are located. Cleanouts in acid waste piping systems shall match piping specified.
2. Cleanouts: Cleanouts for drainage piping, other than acid waste piping, shall be as follows:
 - a. Walls: provide Zurn Model No. ZN-1440-1 style to suit all finishes with vandal proof screws, or comparable product.
 - b. Cast Iron Piping: provide Zurn Model No. ZN-1450-7 with bronze plug, or comparable product.
3. Access Covers / Doors: Where cleanouts are located either behind partitions or flush with finished floor provide access covers or access doors with smooth finish and securing screws.

2.11 PIPE INSULATION

A. General:

1. All pipe and duct systems shall be insulated with Owens Corning Insulation Products or approved equal by John Manville, Knauf Inc. or Pittsburgh Corning Corp. Foamglas.
2. Provide Tapes, Adhesives, Mastics and Sealants that are compatible with and approved by the insulation manufacturer.

3. Plumbing Piping Systems include the following:

- a. Handicapped Fixtures: Sanitary Drains and Traps
- b. Domestic Plumbing Systems: Cold Water & Hot Water Systems (40°F to 110°F).

B. Piping Systems:

1. Handicapped Fixtures:

- a. Exposed Drains and Traps: Insulation for pipe sizes one half (1/2) inch to one and one half (1-1/2) inches shall comply with the following:
 - 1) Material: Flexible Elastomeric
 - 2) Thickness: One half (1/2) inch
 - 3) Vapor Barrier: Yes
 - 4) Field Applied Jacket – Concealed: None
 - 5) Field Applied Jacket – MER Exposed: None
 - 6) Field Applied jacket – Non MER Exposed: None

2. Domestic Water Piping Systems:

- a. Concealed and Exposed Interior Domestic Water Piping: Insulation for pipe sizes one half (1/2) inch to one and one half (1-1/2) inches shall comply with the following:
 - 1) Material: Fiberglass
 - 2) Thickness: One (1) inch
 - 3) Vapor Barrier: Yes, cold water only.
 - 4) Field Applied Jacket – Concealed: None
 - 5) Field Applied Jacket – MER Exposed: Glass Cloth
 - 6) Field Applied jacket – Non MER Exposed: PVC
 - 7) Pipe Fittings: “Zeston” pre molded fittings.

2.12 FLUSHING AND DISINFECTING POTABLE WATER SYSTEMS

- A. General: Subject to compliance with requirements, provide the services of one (1) of the following:

1. Bolan Trane.

- B. Disinfecting Solution: The disinfecting solution shall be a concentration of fifty (50) parts per million water-chlorine solution mixture.

2.13 PROJECT OPERATION AND MAINTENANCE MANUAL ELECTRONIC FILES

- A. Project O & M Manual File: The project OM Manual shall include one (1) electronic copy of each approved submittal and any manufacturer's maintenance manuals, and all warranty certificates included this Division. Also include the address, phone number and contact person for each supplier. Using the UMB Standard O&M Manual Template referenced in Division 01 Closeout Procedures insert the submittal files include both a book mark and tree structure for accessing each submittal file in the manual.

2.14 PIPE SYSTEM HYDROSTATIC/LEAK TEST

- A. Pipe System Hydrostatic/Leak Test: The following Pipe Systems shall be Hydrostatically Leak Tested by the contractor. All piping systems shall be proven tight in the presence of UMB Project Engineer prior to installation of insulation, and connection to exist piping systems. Provide all equipment and labor necessary for hydrostatically testing each system for one (1) hour at the minimum pressures as specified herein unless otherwise noted:
 - 1. Domestic water piping 150 psig
 - 2. Sanitary piping 10 ft w.c. above highest fitting
- B. Systems using Pro-Press piping connectors shall perform a pre-test at 30 psi for 10 minutes. After the hydrostatic test pressure has been applied for ten (10) minutes and with no allowable drop in pressure, the tested system or segment has passed the Pro-Press leak pretest. If after the ten (10) minute test period there is a loss in pressure below the initial test pressure, the test has failed, and the contractor shall examine piping, joints, and connections for leakage. After all leaks have been corrected by tightening, repairing, and/or replacing components as appropriate, the hydrostatic test shall be rescheduled with the University. The test procedure shall be repeated as specified above until there are no leaks and there is no loss in pressure.
- C. Contractors shall use the UMB Standard Hydrostatic/Leak Test Summary Form for recording the leak test results for all pipe systems tested on this Project as follows:
 - 1. Hydrostatic/Leak Test Pipe Systems: See Part 3 for a sample of the UMB Standard Pipe System Leak Test Summary Form.

PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS – EXECUTION

- A. All construction work that creates excessive noise will not be permitted during normal business hours. See Division 01 Specification Section “Cutting and Patching” for requirements.

3.2 CONNECTIONS AND ALTERATIONS TO EXISTING WORK

- A. When existing plumbing work is removed, all pipes, valves, hangers etc. shall be removed back to the active pipe mains and capped.
- B. Removal and/or relocation of existing services shall be closely coordinated with Facilities Management if they impact adjacent areas which shall remain operational.
- C. While performing connections and alterations to existing plumbing work, the contractor shall take extreme care to protect all existing materials, equipment, casework etc. from dirt, debris, and damage. Any damage caused by the contractor to existing materials, equipment, casework, etc. shall be repaired to UMB's satisfaction and specifications at the contractor's expense.

3.3 CUTTING AND PATCHING

- A. Cutting and patching associated with the work in the existing structure shall be performed a neat and workmanlike manner. Existing surfaces that are damaged by the contractor shall be repaired or provided with new materials to match existing.
- B. Structural members shall not be cut or penetrated. Holes cut through concrete and/or masonry to accommodate new work shall be cut by reciprocating or rotary, non-percussive methods.
- C. Patching of areas disturbed by installation of new work and/or required demolition shall match existing adjacent surfaces as to material, texture and color.

3.4 CUTTING, WELDING, BURNING

- A. Before the contractor and/or any sub-contractor commences any cutting, welding, burning or other type of hot work at UMB, the contractor must request a Hot Work Permit from the UMB Office of the Fire Marshal. Hot Work Permits must be requested online at <https://www.umaryland.edu/fire-marshal/hot-work-permits/> at least one (1) day before beginning hot work.
- B. The hot work permit copy shall remain on the job site at the hot work location until such work is completed.

3.5 INSTALLATION – PLUMBING PIPING SYSTEMS

- A. Waste and Vent Piping Systems:
 - 1. Install all, horizontal waste & vent piping systems parallel to the building walls, and partitions with the required minimum slope required by code to provide gravity drainage to the vertical waste, vent and rainwater leaders.

2. Install all, vertical waste& vent piping systems parallel to the building walls, and partitions with the required minimum slope required by code to provide gravity drainage to the vertical waste, vent and rainwater leaders.

B. Domestic Water Piping Systems:

1. Install domestic water piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
2. Install domestic water piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
3. Install domestic water piping above accessible ceilings to allow sufficient space for ceiling panel removal and coordinate with other services occupying that space.
4. Install domestic water piping to permit valve servicing.
5. Install domestic water piping free of sags and bends.
6. Install fittings for changes in direction and branch connections.
7. Install branch pipe connections off the top of the main pipe or on a 45-degree upward angle. Branch connections off the bottom of the main pipes are not acceptable.

3.6 PIPING SPECIALTIES

A. Dielectric Connections:

1. Install dielectric connections when piping of dissimilar metals piping and tubing are joined.
2. Dielectric Connections for NPS 2 and Smaller: Use stainless steel threaded nipples.

3.

B. Trap Primers:

1. Toilet Rooms: In toilet rooms provide a trap primer line (TPL) from the electronic trap primer, to the floor drain outlet pipe below the floor. Connections to the drain body with-in the concrete floor slab is not permitted. Refer to drawing details.

C. Cleanouts (CO):

1. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 - a. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 - b. Locate at each change in direction of piping greater than 45 degrees.
 - c. Locate at minimum intervals of fifty (50) feet for piping NPS 4 and smaller and one hundred (100) feet for larger piping.
2. Horizontal Piping above Ceilings: For cleanouts in concealed horizontal piping above a suspended ceiling provide one (1) of the following CO installations:
 - a. Where the CO location is not close a wall or partition on the floor above locate the cleanout at the floor slab above with a cover plate suitable for the floor finish.
 - b. Where the CO location is close a wall or partition on the floor above extend the piping into the wall or partition and locate the cleanout forty eight (48) inches above the finished floor with an access cover on the wall.

3.7 INSTALLATION – PIPE SLEEVES

- A. Fire Rated Walls: Where new and/or existing plumbing piping passes through rated walls provide pipe sleeves with required fire sealant materials to maintain the rating of the wall assembly.
 1. Use standard weight steel pipe or service weight cast iron pipe for pipe sleeves. Where sleeves are installed in floors and load bearing walls, use only standard weight steel pipe for pipe sleeves.
 2. Provide a minimum of one half (1/2) inch annular space clearance around the entire circumference of the pipe and/or insulation on cold piping passing through the sleeve and between the pipe sleeve and the surface of the core drilled hole.
 3. Center pipe passing through sleeve.
 4. Except for cold piping, do not continue insulation through sleeve.
 5. The entire annular spaces must be sealed with fire and waterproof sealant Seal ends of pipe insulation and butt insulation ends up to fire stopping sealant in sleeve.
 6. Sleeves in walls must be installed flush with both finished wall surfaces.
 7. In finished areas provide an escutcheon plate around the bare pipe or insulated pipe passing through the assemblies to conceal the sleeve and sealant.
- B. Fire Rated Floors: Where new and/or existing plumbing piping passes through rated walls provide pipe sleeves with required fire sealant materials to maintain the rating of the wall assembly.
 1. Use standard weight steel pipe or service weight cast iron pipe for pipe sleeves.

2. Provide a minimum of one half (1/2) inch annular space clearance around the entire circumference of the pipe and/or insulation on cold piping passing through the sleeve and between the pipe sleeve and the surface of the core drilled hole.
3. Center pipe passing through sleeve.
4. Except for cold piping, do not continue insulation through sleeve.
5. The entire annular spaces must be sealed with fire and waterproof sealant.
6. Seal ends of pipe insulation and butt insulation ends up to waterproof sealant in sleeve.
7. Sleeves must be installed with top of sleeve one (1) inch above the finished floor surface. The bottom of the sleeve must be flush with the finished surface of the underside of the floor assembly.
8. In finished areas provide an escutcheon plate around the bare pipe or insulated pipe passing through the assemblies to conceal the sleeve and sealant. If a riser clamp is in place, omit the escutcheon.

C. Sealant Requirements: Comply with requirements for sealants specified in Part 2.

D. Fire-Barrier Penetrations: Comply with requirements for firestopping specified in Part 2.

E. Non-Fire-Rated Soundproof Partition Penetrations: Where pipes pass through interior partitions with sound proofing provide a pipe sleeve. Seal the annular spaces between construction openings, the sleeve, the pipe and/or pipe insulation with soundproof insulation material equal to the width of the opening. The soundproof insulation shall match the insulation in the partition.

3.8 INSTALLATION – VALVES

A. Valves shall be placed in such manner as to be easily accessible for smooth and easy hand wheel operation and packing maintenance.

B. Install valves in piping systems were shown on drawings, diagrams and details and were indicated below:

1. To Isolate:
 - a. Toilet rooms.
 - b. Lavatory sinks
 - c. Countertop Sinks
 - d. Bath Tub/ Shower
 - e. Trap Primers
 - f. Branch piping.
2. To Drain:
 - a. Low points in piping systems.
 - b. Trapped sections in the piping system.

- C. Where piping or equipment may be subsequently removed, provide valves with bodies, having integral flanges or full lugs drilled and tapped to hold valve in place so that downstream piping or equipment can be disconnected and replaced with blank-off plate while valve is still in service.
- D. Shut off valves serving equipment and/or control valves shall be installed full size at the equipment connection.
- E. Where there is no interference, shut-off valves shall be installed with hand wheel located up on the horizontal runs of pipe to prevent accumulation of foreign matter in working parts of valves.
- F. On valves, strainers, etc., installed in copper piping, provide a union on the discharge side of each valve, and threaded adapters where copper piping connects to valves, strainers, etc.

Install drain at trapped/low points in mains, branch lines, and everywhere else required to permit drainage of the entire piping system.

3.9 INSTALLATION – HANGERS AND SUPPORTS

- A. Piping Systems: Hangers and supports shall be provided for all piping systems, as recommended by the hanger manufacturers for the existing structural elements. Additional requirements are as follows:
 - 1. On piping systems requiring insulation, hangers and supports shall be installed external to the insulation material, and sheet metal saddles shall be provided.
 - 2. Hangers and supports shall be provided at all changes of direction and elevations on piping system.
 - 3. Spacing shall be as recommended by manufacturer, for each pipe size and material type.

3.10 INSTALLATION – PIPE INSULATION

- A. Fiberglass Pipe Insulation:
 - 1. All insulation shall be installed by a qualified insulation contractor. Insulation installed on cold surfaces shall have a vapor barrier and exposed ends shall be sealed. All insulation shall be installed and all seams, sealed, with Benjamin Foster sealant, according to manufacturer's recommendations.
 - 2. Bond insulation to pipe with lagging adhesive.

3. Seal exposed ends with lagging adhesive.
4. Seal seams and joints with vapor barrier compound.
5. Where existing pipe insulation is disturbed for demolition work, and piping is capped, repair and seal damaged insulation.
6. Where existing pipe insulation is disturbed for demolition work, and new piping is connected at that location, butt new insulation up to the existing insulation and seal the joints as specified herein.
7. On new piping systems requiring insulation all pipe insulation shall be continuous through point of support. Provide sheet metal saddles between insulation and pipe hangers.
8. Where new piping connects to existing piping the new insulation shall match the thickness of the existing insulation.

3.11 INSTALLATION – PIPE LABELS

- A. General: Provide pipe labels with directional arrows every twenty five (25) feet on straight runs of horizontal and vertical pipes exposed in equipment rooms, utility shafts and above ceilings. In addition to the referenced spacing above comply with the following:
 1. Where pipes pass through floors, walls and partitions provide pipe labels on each side of the penetration.
- B. Concealed Piping: Install pipe labels in accessible locations on the piping systems so they are visible from the point of access through the ceiling tile or ceiling access door.
- C. Directional Arrows: Install directional arrows to indicate the correct flow direction.
- D. All pipe labels and flow arrows that are found to be incorrectly installed shall be replaced and corrected at no additional cost to the project.

3.12 FLUSHING AND DISINFECTING POTABLE WATER SYSTEM PROCEDURE

- A. General Requirement: The contractor shall secure the services of the water treatment company that is under service contract to UMB, to clean, flush and add chemical treatment to new piping systems that are required to be connected to existing piping systems serving the building or campus. The cost for labor and material for this work must be included in the contractors bid price. The contractor shall be responsible for the scope of work for the UMB water treatment company.

- B. Piping Systems: Where new potable water piping (cold water, hot water) are connected to the existing potable water system the new piping and the sections of the existing piping downstream from the new pipe connections and the piping to the new plumbing fixtures and outlets shall be flushed until the water runs clear and free of debris or particles and disinfected. Faucet aerators or screens shall be removed during the flushing operation.
- C. Flushing: Isolate the existing and new water piping in the project area from the rest of the floor or building. Flush the isolated piping system including the faucets, with clean cold water for at least twenty (20) minutes or until the water is clear of any particles or debris.
- D. Disinfecting: Comply with the following:
 - 1. All water outlets shall be posted to warn against use during disinfecting operations.
 - 2. Disinfecting shall be performed by persons experienced in such work.
 - 3. The water supply to the piping system or parts thereof being disinfected shall be valved-off from the normal water source to prevent the introduction of disinfecting agents into a public water supply or portions of a system that are not being disinfected. The plumbing contractor shall provide plumbing connections and power for pumping chlorine into the system.
 - 4. The piping shall be disinfected with a water-chlorine solution. During the injection of the disinfecting agent into the piping, each outlet shall be fully opened several times until a concentration of not less than fifty (50) parts per million chlorine is present at every outlet. The solution shall be allowed to stand in the piping for at least twenty four (24) hours.
 - 5. At the end of the required retention time, the residual level of chlorine at every outlet shall be not less than five (5) parts per million. If the residual is less than five (5) parts per million, the disinfecting procedure shall be repeated until the required minimum chlorine residual is obtained at every outlet.
 - 6. After the required residual chlorine level is obtained at every outlet, the system shall be flushed to remove the disinfecting agent. Flushing shall continue until the chlorine level at every outlet is reduced to the chlorine level of the water serving areas outside on the project area.
 - 7. Any faucet aerators or screens that were removed shall be replaced.
- E. Certification: A certification of performance and laboratory test report showing the absence of coliform organisms shall be submitted to the UMB upon satisfactory completion of the disinfecting operations.

3.13 CLEAN – UP

- A. Excessive debris and dirt, such as occurs from cutting through masonry or plaster walls shall be cleaned up from the equipment and removed immediately after the work of cutting through the walls.

- B. Debris shall be removed from UMB property.
- C. Ceiling panels shall be replaced as soon as work is finished in the area and shall be kept free of dirty fingerprints. Where work is being done in corridors used by patients and visitors, ceiling panels shall be replaced at the close of the day's work even if work is at the particular location is incomplete.
- D. All areas shall be left broom-clean at the end of the work period.
- E. Remove all mechanical clipping, wiring, nuts, bolts, etc. left on top of ceilings and ceiling tiles.

3.14 FUNCTIONAL TESTING OF PLUMBING SYSTEMS

A. Testing Preparation:

- 1. Certify in writing to the UMB testing agent that new plumbing systems, subsystems, and equipment have been installed, and are operating according to the Contract Documents.
- 2. Certify in writing to the UMB testing agent that new plumbing systems have been leak tested according to the Contract Documents.
- 3. Certify in writing to the UMB testing agent that new plumbing systems have been flushed and disinfected according to the Contract Documents.

B. New Plumbing Systems, Subsystems, and Equipment Testing Procedures:

- 1. Procedures: Where applicable follow manufacturer's written procedures. If no procedures are prescribed by the manufacturer, proceed as indicated.
- 2. Plumbing Piping Distribution Systems: Includes domestic water installed in the project area.
 - a. Verify that all new valves and accessories have been installed correctly, are accessible and operate as intended.
 - b. Verify that specified tests of piping are complete.
 - c. Verify all new plumbing fixtures and accessories have been installed correctly and are operating as intended.

3.15 COMPLETED HYDROSTATIC/LEAK TEST FORMS

- A. Upon completion of each hydrostatic/test, the contractor shall upload the signed leak test forms to the Project File, in ebuilder, in Folder 11.06 Test Reports.

3.16 UMB STANDARD HYDROSTATIC/LEAK TEST SUMMARY FORMS

- A. General: Contractors shall use the UMB Standard Form for Recording the Hydrostatic/Leak Test Results for all Pipe Systems Tested on this Project.
 - 1. Pipe System Sample Form: See the following page for a sample of the UMB Standard Pipe System Hydrostatic/Leak Test Summary Form.
 - 2. Availability: The standard test summary form is available on the UMB Web Site at:
<https://www.umaryland.edu/designandconstruction/resources/contractors/>
 - 3. Field Testing: For field testing download and copy the forms from the UMB web site. Do not use attached “Sample Forms” for testing.

UMB STANDARD PIPE SYSTEM HYDROSTATIC/LEAK TEST SUMMARY FORM

TEST DATA:

Date: _____ Project Number: _____

Location: _____

Pipe System Tested (Service): _____

Location and Description: _____

Pipe Materials: _____

Operating Pressure: _____

Specified Test Pressure: _____

Actual Test Pressure: _____

Pressure Test Type: _____

Test Start Time: _____ Recorded Test Pressure: _____

Test Completion Time: _____ Recorded Test Pressure: _____

Test Duration: _____ Pressure Drop or Rise: _____

Test Result (Pass/Fail): _____

SIGNATURES:

Construction Manager: _____

Construction Manager Representative: _____

Mechanical Contractor: _____

Mechanical Contractor Forman: _____

UMB Division: _____

UMB Witness: _____

Remarks: _____

END OF DIVISION 220000

DIVISION 230000 – HVAC

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. The mechanical contractor shall furnish all labor, material, tools, equipment and services necessary and incidental for installing all mechanical systems shown on the drawings, indicated in the specification, or necessary to provide a finished installation. The finished installation shall be in perfect working condition and be ready for continuous and satisfactory operation. The project area is located on the sixth floor of the School of Nursing building, 655 W. Lombard St, Baltimore, MD 21201.

1.3 CODES AND REGULATIONS

- A. All materials furnished and all work installed shall comply with the codes and regulations adapted by the State of Maryland and recommendations of the following bodies:
 - 1. International Building Code (IBC)
 - 2. International Mechanical Code (IMC)
 - 3. International Plumbing Code (IPC)
 - 4. National Electric Code (NEC)
 - 5. Maryland State Health Department
 - 6. Underwriters Laboratories (UL)

1.4 RESPONSIBILITY

- A. The Construction Manager/General Contractor (CM/GC) shall be responsible for all work included in this Division. The delegation of work to the contractors shall not relieve him of this responsibility. Contractors who perform work under this Division shall be responsible to the CM/GC.

1.5 SITE VISIT

- A. Prior to preparing the bid, the HVAC contractor shall visit the site and become familiar with all existing conditions. Make all necessary investigations as to locations of utilities and existing field conditions that could affect the work. No additional compensation will be made to the contractor as a result of his failure to familiarize himself with the existing conditions under which the work must be performed.

1.6 OUTAGES

- A. For all work requiring an outage, the HVAC contractor shall submit an outage request to the UMB Project Manager, using the UMB Standard Request for Outage Form which is available through the UMB Design and Construction Web Site at:
<https://www.umb.edu/designandconstruction/resources/contractors/>
- B. The existing mechanical/electrical/fire protection systems shall remain operational unless turned off by University personnel during the construction of the project.
- C. Unless otherwise specified, outages of any services required for the performance of this contract and affecting areas other than the immediate work area shall be scheduled at least ten business days (10) days in advance with the UMB Design and Construction Department. Outages shall be performed during normal duty hours. If necessary some outage work may be performed outside normal hours if approved by UMB.
- D. All HVAC outages which will interfere with the normal use of the building in any manner shall be done at such times as shall be mutually agreed upon by the contractor and the UMB Design and Construction Department.
- E. The HVAC contractor shall include in his price the cost of all premium time required for outages and other work which interferes with the normal use of the building, which will be performed, in most cases, during other than normal work time and at the convenience of the University.
- F. The operation of HVAC valves or switches; required to achieve an outage must be operated by University personnel only. Unauthorized operation of HVAC valves, power switches, by contractors and their personnel will result in extremely serious consequences for which the contractor will be held accountable.

1.7 SUBMITTALS

- A. General: For general requirements see Architectural Specification Division 01 Section "Submittal Procedures". Also comply with the following:
 - 1. UMB requires all that all submittals, which includes shop drawings, product data, related equipment maintenance manuals, warranty documentation and all other pertinent information be submitted electronically by the manufacturer, trade contractors, and construction manager as a "pdf" file for review as required by Division 01. Partial submittals are not acceptable and will be returned without review.
 - 2. After contract award and before material is ordered submit electrically all product data, shop drawings and other such descriptive data as the Engineer may require to demonstrate compliance with the contract documents as required by the contract

clauses for review and approval. All construction and administrative type submittals shall be transmitted through ebuilder to the A/E Team and UMB.

3. Submittals for products and/or equipment, shall include the manufacturer's name, submittal sheets, cataloged or computer-generated performance data sheets, product / equipment dimensions and access requirements, equipment operating weights, project specification and paragraph reference for each product and/or equipment the Contractor proposes to furnish.
4. Submittals will be reviewed for general compliance with design concept in accordance with contract documents, but dimensions, quantities, or other details will not be verified.
5. Product Submittals shall include the following items unless otherwise noted:
 - a. Article 2.2, Fire Stops & Smoke Seals for Wall & Floor Sleeve Applications
 - b. Article 2.3, HVAC Piping Systems
 - c. Article 2.4, Pipe Sleeves
 - d. Article 2.5, Piping Specialties
 - e. Article 2.6, Flow Meter Stations
 - f. Article 2.7, HVAC Valves
 - g. Article 2.8, Hangers and Supports
 - h. Article 2.9, Identification System
 - i. Article 2.10, HVAC Terminal Units
 - j. Article 2.11, Ductwork and Accessories
 - k. Article 2.13, HVAC Insulation
 - l. Article 2.14, BAS
 - m. Article 2.15, TAB Report
 - n. Article 2.16, O & M Manual
 - o. Warranties and maintenance instructions shall be included in the O & M Manual only. Do not include this data in the Product Submittals.
6. Submittal File Format: File formats and names for each submittal shall be electronically as follows:
 - a. File Formats:
 - 1) Product Data: "pdf" file format.
 - 2) Design Shop Drawings: "pdf" and "dwg" file formats.
 - 3) Coordinated Drawings: "pdf" or "dwg" file formats.
 - 4) Schedules: "xl" file format.

1.8 SAMPLES

- A. Samples of materials to be used on the work shall be submitted when requested and shall be subject to approval by the A/E and the UMB Design and Construction Department.

1.9 IDENTIFICATION BADGES

- A. Contractors must obtain photo identification cards for all employees who will be at the construction site. The University will charge the contractor \$25.00 for each badge as a deposit of which \$20.00 will be returned when the badge is returned. Lost photo I.D. card will cost \$25.00 for another replacement card. (The above charges are subject to change without notice.)

1.10 HAZARDOUS MATERIALS

- A. Identification and removal of hazardous materials (asbestos, lead paint, PCBs) is not part of this contract. If questionable material is encountered, notify the University Project Manager and the University Environmental Health and Safety in writing immediately. The University shall then arrange for investigation and possible abatement of the material. Contractor shall schedule his work to accommodate hazardous material removal by the Owner.

1.11 FUNCTIONAL TESTING OF NEW HVAC SYSTEMS

- A. Summary: This article includes the requirements for functional testing of new HVAC Systems, assemblies and equipment related to the project area.
- B. Functional Testing will be performed by UMB staff.
- C. Description: The following equipment and/or accessories shall be tested as part of this project:
 - 1. HVAC Systems:
 - a. Air Distribution Systems:
 - 1) Air Terminal Units.
 - a) Supply terminal units.
 - b) Fan-powered supply terminal units
 - b. BAS:
 - 1) Local control components for installed equipment.
 - 2) Integration into campus system.
 - 3) Project graphics and programming.

1.12 MOTOR REQUIREMENTS

- A. Compliance: Comply with NEMA MG 1 unless otherwise indicated.
- B. Motor Requirements: Requirements below apply to motors covered by this Division except as otherwise indicated.
 - 1. Motors smaller than 1/2 HP: Single phase.
 - 2. Frequency Rating: 60 Hz.
 - 3. Voltage Rating: Determined by voltage of circuit to which motor is connected for the following motor voltage ratings (utilization voltages):
 - a. 120 V Circuit: 115 V - motor rating.
 - 4. Minimum service factor shall be 15% and shall apply at frequency and utilization voltage at which motor is connected. Provide motors which will not operate in service factor range when supply voltage is within 10% of motor voltage rating.
 - 5. Capacity: Sufficient to start and operate connected loads at designated speeds in indicated environment, and with indicated operating sequence, without exceeding nameplate ratings. Provide motors rated for continuous duty at 100% of rated capacity.
 - 6. Temperature Rise: Based on 40°C ambient except as otherwise indicated.
 - 7. Enclosure: Open drip proof, unless otherwise specified. Provide screen over slots, where slots will permit passage of human extremities.
 - 8. Motors without VFD's: Motors 5 HP and lower shall be variable speed ECM motors with combination starter, disconnect and auxiliary contacts to interface with the BAS.
- A. Single Phase Motors:
 - 1. Motors larger than 1/20 hp shall be one (1) of the following, to suit starting torque and requirements of specific motor application:
 - a. Permanent-split capacitor.
 - b. Split phase.
 - c. Capacitor start, inductor run.
 - d. Capacitor start, capacitor run.
 - 2. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
 - 3. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
 - 4. Motors 1/20 HP and Smaller: Shaded-pole type.
 - 5. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

1.13 WARRANTY/GUARANTEE

- A. All materials, equipment, etc. provided by the general contractor and/or his subcontractors shall be warranted and guaranteed to be free from defects in workmanship and materials for a period of two (2) years from the date of substantial of completion and acceptance of work by UMB. Any defects in workmanship, materials, or performance which appear within the guarantee period shall be corrected by the contractor without cost to the owner, within a reasonable time, to be specified by UMB. In default thereof, owner may have such work done and charge the cost of same to the contractor. In addition to the above statement the Warranty/Guarantee Period shall also include all labor cost related to all warranty work. For compressorized equipment include an additional three (3) year Warranty/Guarantee Period.

PART 2 – PRODUCTS:

2.1 LISTED MANUFACTURERS

- A. Listed Manufacturers: The manufacturers indicated in Part 2 represent the basis for design and identify the minimum level of quality for materials and equipment, specified in this Division, that are acceptable to UMB. Unless “or equal” is included as an option, substitutions are not allowed, except under the following condition. During bid phase, contractors may submit material and equipment by non-listed manufacturers provided said submittals meet the requirements of these specifications. All submitted materials and equipment are subject to approval by the A/E and UMB. Reference: Division 1 Substitution Section.

2.2 FIRE STOPS & SMOKE SEALS FOR WALL SLEEVE APPLICATIONS

- A. General: Provide fire stops, and smoke sealant materials for all HVAC services penetrating through rated assemblies. See Architectural Specification Division 07, Section “Penetration Firestopping” for sealant material requirements. Services include:
 - 1. HVAC penetrations include piping systems and duct systems.
- B. New Construction: All new penetrations shall be provided with a pipe sleeve and sealant materials.
- C. Existing Construction: All new service penetrations through existing rated assemblies shall be provided with a pipe sleeve and sealant materials. All existing unsealed penetrations for services passing through existing rated assemblies within the project area shall be provided with sealant materials.
- D. Project Area: The project area shall include the finished spaces and related sections of the utility shafts within the project area footprint.

- E. Wall Pipe Sleeve Applications: Pipe sleeves shall be required for all new pipe penetrations through rated wall assemblies and non-rated CMU walls. Where pipe sleeves are installed in non-rated CMU walls fire rated sealant materials are not required. Provide acoustical caulking to seal the annular spaces between the sleeve and the bare pipe or pipe insulation on each end with one half (1/2) inch caulking all around the annular space.

2.3 HVAC PIPING SYSTEMS

- A. General: Provide all piping systems indicated on the drawings and as specified below, including all labor materials and equipment necessary for a complete installation.
- B. HVAC Piping Systems: HVAC piping systems include hydronic piping systems as follows:
 - 1. Hydronic Water Piping Systems: Hydronic water piping systems include, Heating Hot Water Systems. Pipe, fittings and joints shall be as follows:
 - a. Solder Connection: Hydronic water piping two (2) inch and smaller shall be type 'L' copper tubing assembled with wrought copper fittings and 95-5 solder.
 - b. Press End Connection: Hydronic water piping two (2) inch and smaller shall be type 'L' copper tubing assembled with Viega ProPress copper fittings with EPDM seals and press connection with EPDM sealing. (Contractor Option)

2.4 PIPE SLEEVES

- A. Steel Pipe Sleeves: Steel pipe sleeves shall be standard black steel pipe Type E, Grade B, with plain ends conforming to ASTM A53/A53M.
- B. Cast Iron Pipe Sleeves: Cast iron pipe sleeves shall be standard weight cast iron pipe with plain ends conforming to ASTM A74 and CISPI – 301.

2.5 PIPING SPECIALTIES

- A. General: Provide all piping specialties where indicated on the drawings, details, and as specified below complete with all supports, fittings, etc. for HVAC Piping Systems.
- B. Piping Specialties:
 - 1. Manual Air Vents: Crane # 2910H, one quarter (1/4) inch Brass Cock
 - 2. Pressure/Temperature Plugs: Provide one quarter (1/4) inch ball valve.

3. Strainers:
 - a. Copper Piping (two (2) inch and smaller): Mueller Model 352M, 250 psig working pressure; cast bronze body with threaded ends, conforming to ASTM B 61, and perforated 20 mesh Type 304 stainless steel screen, blow-down drain with plugged valve and threaded hose connection.
4. Flexible Connections: Metraflex flexible pipe connectors with stainless steel hose and braid, and copper end tubes, or schedule 40 IPS pipe ends.
5. Dielectric Connections: Provide dielectric connections where nonferrous metal is joined to ferrous metal as follows:
 - a. Piping Two (2) Inch and Smaller: Provide Schedule 40 unlined type 316 stainless steel nipples, four (4) inches long with thread ends.

2.6 FLOW METER STATIONS

A. Flow Metering Stations:

1. General: Provide Flow Metering Stations (FMS) and accessories, for balancing all Hydronic Systems where indicated on the drawings, Details, Diagrams, etc. Flow Metering Stations shall be either, the Venturi Type, Pitot Tube Type or a combination of both types as specified hereinafter. Each Metering Station shall be fully assembled and include a Polycarbonate Tag. Each tag shall include the Manufacturers Model Number, Serial Number and 'CV' Flow Rate. Include the manufacturer's pressure differential tables with indicated selections for each FMS. Select each FMS so the design flow rate is within a pressure differential range of ten (10) inch wg through one hundred ten (110) inches wg.
2. Piping Systems One Half (1/2) Inch Through Two (2) Inch: For connections to reheat coils provide Venturi Type Flow Meter Stations and accessories as indicated. All components shall be by the same manufacturer with thread end connections by one (1) of the following:
 - a. Venturi/ Ball Valve: Venturi/Ball Valve Type Flow Meter Stations shall be of Brass Construction, with Female Threaded End Connections, one quarter (1/4) inch P & T Connections with Quick Connects, Integral Brass Full Port Ball Valve with Stainless Steel Ball and Stem, Memory Stop, Integral Union with 'O' Ring Seal on Inlet side, Teflon Seals, conforming to ASTM B283-06.B.
 - b. Strainer/Ball Valve: Strainer/Ball Valve shall be a one assembly with a strainer having a removable stainless steel strainer and hose end drain valve

with a chain and cap, the ball valve shall be a full port valve with stainless steel ball and stem. Also include a brass P/T Port with a cap and chain.

- c. Union/PT Assembly: Union/PT assembly shall be forged brass with a P/T Port with a cap and chain.
- d. Flexible Hose Assembly: Not permitted at UMB.
- e. Basis of Design: The basis of design are products by NuTech Hydronic Specialties as follows:
 - 1) NuTech Hydronic Specialties:
 - a) Venturi/ Ball Valve: Model MB
 - b) Strainer/Ball Valve: Model SV
 - c) Union/PT Assembly: Model UB
- f. Other Acceptable Manufactures: Subject to compliance products by one (1) of the following manufacturers are also acceptable:
 - 1) Flow Design Inc.:
 - a) Venturi/ Ball Valve: Model US-SBS
 - b) Strainer/Ball Valve: Model YC - SBS
 - c) Union/PT Assembly: Model UP w/ SS2511 P/T Port
 - 2) Griswold Quickset:
 - a) Venturi/ Ball Valve: Model QS0 through QS3
 - b) Strainer/Ball Valve: Model Isolator 'S'
 - c) Union/PT Assembly: Model Isolation Union w/ CPTA
 - 3) HCI Hydronic Components:
 - a) Venturi/ Ball Valve: Model Terminator B SS
 - b) Strainer/Ball Valve: Model Terminator Y SS
 - c) Union/PT Assembly: Model Terminator U
 - 4) PRO Hydronic Specialties L.L.C.:
 - a) Venturi/ Ball Valve: Model CBV050L & H through CBV 070L & H, and CBV 100 through CBV200
 - b) Strainer/Ball Valve: Model CBYU
 - c) Union/PT Assembly: Model AU

2.7 HVAC HYDRONIC VALVES

- A. Shut Off, Drain and Specialty Valves: All Shut Off, Drain and Specialty Valves installed in HVAC Hydronic Piping Systems shall be as specified below. Gate Vales will not be permitted for installation in these systems. All valves used in hydronic systems shall be Lead Free Certified per NSF/ANSI 61 and NSF/ANSI 372. Only listed manufacturers and model numbers below are acceptable to UMB.

1. Shut Off Valves for Hydronic Solder Joint Piping Systems:

- a. Shut Off Valves for Piping Systems One Half (1/2) Inch through Two (2) Inch: All valves used for shutoff duty shall be two (2) piece full port (FP) lead free ball valves with brass or bronze valve body with threaded end connections, solid tunnel bore 316 stainless steel ball and stem, RPTFE seats and seals, and valve lever type handle. Valve model numbers shall be as listed below:

Apollo: 77FLF-140* Series, Brass Body.

Milwaukee: UPBA400S* Series, Bronze Body.

Watts: LFB6080G2-SS*, Brass Body.

- b. Contractor Note: Branch piping and associated shut off valves for terminal unit reheat coils shall not be less than three quarter (3/4) piping.

*Provide stem extensions on valves where pipe insulation affects the operation of the valve handle.

2. Shut Off Valves for Hydronic ProPress (Press End) Piping Systems: (Contractor Option)

- a. Shut Off Valves for Piping Systems One Half (1/2) Inch to Two (2) Inch All valves used for shutoff duty shall be two (2) piece full port lead free ball valves with brass or bronze valve body with smart end connections, solid tunnel bore 316 stainless steel ball and stem, EPDM or PTFE seats and seals, and valve lever type handle Valve model numbers shall be as listed below:

Viega: 2971.3ZL, Bronze Body*

Apolloxpress 77WLF-140*, Bronze Body

Milwaukee: UPBA480S*, Brass Body

*Provide stem extensions on valves where pipe insulation affects the operation of the valve handle.

3. Drain and Specialty Valves for Hydronic Piping Systems:

- a. Drain Valves for Piping Systems One Half (1/2) Inch to Two (2) Inch: All valves used as low point drains or for system drain down duty shall be three quarter (3/4) inch two (2) piece full port (FP) lead free ball valves with brass or bronze valve body with threaded end connections, solid tunnel bore 316 stainless steel ball and stem, RPTFE seats and seals, and valve lever type handle and three quarter (3/4) inch capped hosed connection. Valve model numbers shall be as listed below:

Apollo: 77FLF-140* Series, Brass Body.

Milwaukee: UPBA400S* Series, Bronze Body.

Watts: LFB6080G2-SS*, Brass Body.

- b. Drain Valves for Piping Systems two and One Half (2-1/2) Inch and Larger: All valves used as low point drains or for system drain down duty shall be two (2) inch two (2) piece full port (FP) lead free ball valves with brass or bronze valve body with threaded end connections, solid tunnel bore 316 stainless steel ball and stem, RPTFE seats and seals, and valve lever type handle and two and one half (2-1/2) inch capped hosed connection. Valve model numbers shall be as listed below:

Apollo: 77FLF-140* Series, Brass Body.

Milwaukee: UPBA400S* Series, Bronze Body.

Watts: LFB6080G2-SS*, Brass Body.

- c. Specialty Valves: All specialty valves used for Pressure Gages, P/T Plugs, and DP Switches shall be one quarter (1/4) inch two (2) piece full port (FP) lead free ball valves with brass or bronze valve body with threaded end connections, solid tunnel bore 316 stainless steel ball and stem, RPTFE seats and seals, and valve lever type handle. Valve model numbers shall be as listed below:

Apollo: 77FLF-140* Series, Brass Body.

Milwaukee: UPBA400S* Series, Bronze Body.

Watts: LFB6080G2-SS*, Brass Body.

BAS Control Valves for HVAC Piping Systems:

- a. Control Valves for HVAC Piping Systems (1/2 inch to 1 inch) for terminal units shall be globe type valves with bronze or forged brass body, NPT threaded ends, brass trim, type 303 stainless steel stem, metal to metal seat, ethylene propylene 'O' ring packing, ANSI Class 250, and selected to provide the scheduled gpm flow rate @ a maximum pressure drop of ten (10) feet. See

equipment schedules for design flow rates. Valve type shall be one (1) of the following as selected by ATC:

- 1) Valve Sizes 1/2 inch to 1 inch: Siemens Powermite MT Series valves for hydronic service.
- 2) Valve Sizes 1/2 inch to 2 inch: Siemens Flowrite Series valves for hydronic service.

*Extensions: where necessary provide shaft extensions to allow mounting of the valve operator outside of pipe insulation.

- a. These valves shall be provided by the BAS contractor and installed in the piping systems by the mechanical contractor including isolation valves. All required connections to the BAS shall be by the BAS contractor.

2.8 HANGERS & SUPPORTS

- A. General: Provide all supports, identification, and testing for all piping systems indicated on the drawings, details and as specified below.

- B. Interior Pipe System Hangers & Supports:

1. Hangers and supports shall be provided for all piping systems, as recommended by the hanger manufacturers for the existing structural elements. On piping systems requiring insulation, hangers and supports shall be installed external to the insulation material, and sheet metal saddles shall be provided. Hangers and supports shall be provided at all changes of direction and elevations on piping system. Spacing shall be as recommended by manufacturer, for each pipe size and material.
2. Hangers, Supports, and Components: Provide factory fabricated products according to MSS SP-58 as manufactured by B-Line, Fee and Mason, ITT Grinnell, Pipe Shields, Inc., Michigan Hanger, and Unistrut. Unless otherwise indicated, specified model numbers are manufactured by B-Line.
3. Components include galvanized coatings were installed for piping and equipment that will not have a field-applied finish.
4. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.
5. Thermal Hanger Shield Inserts: 100-psi (690kPa) average compressive strength, waterproofed calcium silicate or treated lumber inserts, encased with sheet metal

shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.

6. Insulated Horizontal Piping Hangers: Heating Hot Water:
 - a. Two (2) inch and smaller: Figure No. B3108, with metal shield, Figure No. B3151.

2.9 IDENTIFICATION SYSTEM

- A. General Requirements: Do not use pipe labels or plastic tapes for bare pipes conveying fluids at temperatures of 125°F (52°C) or higher.
- B. Identification Products for Mechanical Systems: Identification products for Mechanical Systems shall include pipe markers, duct markers, valve tags and ceiling markers conforming to ANSI/ASME A 13.1 OSHA requirements for letter/color combinations and as follows:
 1. Pipe Labels: Provide pretensioned, preformed semi-rigid vinyl or plastic pipe labels with flow arrows to partially cover or cover full circumference of pipe and to attach to pipe without adhesive. Pipe labels shall be SETMARK System as manufactured by Seton Name Plate Corporation or approved equal.
 - a. Label Material: Comply with the following:
 - 1) Vinyl Formed Labels:
 - a) External diameters up to two (2) inches – 20 mil vinyl.
 - b) External diameters up to two and one half (2-1/2) inches – 30 mil vinyl.
 - 2) Plastic Formed Labels: per manufacturer's recommendations.
 - b. Label Contents: HVAC: Text with Field/Letter color as noted below
 - 1) "HEATINGWATERSUPPLY" – Yellow/Black
 - 2) "HEATING RETURN" – Yellow/Black
 2. Duct Stencil Labels: Provide duct stencil labels with the following designations and letter color:
 - a. Supply Air Duct: "Supply Air Duct – STU – #"
 - b. Main Supply Air Duct: "Main Supply Air Duct – AHU – #"
 - c. General Exhaust Air Duct: "General Exhaust Air Duct – GEF – #"
 - d. Return Air Duct: "Return Air Duct – AHU- #"
 3. Valve Tags:

- a. Description: Stamped or engraved with one quarter (1/4) inch letters for piping system abbreviation and one half (1/2) inch numbers with:
 - 1) Brass Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2) Fasteners: Brass wire-link chain.
 - 3) Asterisk (*): Indicates the valve is part of a renovation project in the building.
 - b. HVAC: Service – Tag Data:
 - 1) Hot Water Reheat Water Supply – *HWRHS
 - 2) Hot Water Reheat Return – *HWRHR
4. Ceiling Markers: Ceiling Grid and Access Panel Markers: Provide Kroy type clear adhesive printed labels with three sixteenth (3/16) inch high letters to identify the location of concealed valves and equipment.
- a. Ceiling Marker Data: For HVAC Systems include:
 - 1) System Valves: Identify as follows:
 - a) Hot Water Reheat Supply – “HVAC Valve – HWRS”
 - b) Hot Water Reheat Return – “HVAC Valve – HWRR”
 - c) Hot Water Low Point Drains – “HVAC LPD – HWR(R/S))
 - 2) System Equipment: Identify as follows:
 - a) Supply Terminal Unit HVAC – Refer to Schedule.
 - b) Fan Powered supply Terminal Unit – Refer to Schedule

2.10 HVAC EQUIPMENT – AIR TERMINAL UNITS

- A. General: Unless otherwise indicated provide all HVAC equipment indicated on the drawings and as specified below, including all labor materials and equipment necessary for a complete installation.
 1. Terminal Unit Configurations: Terminal unit configurations shall be either RH or LH when facing the unit’s inlet duct as indicated on the drawings and details.
- B. HVAC Equipment – Supply Terminal Units – Contractor Supplied and Installed:
 1. General Requirements: Supply Terminal Units: Terminal Units: Supply and exhaust air terminal units shall be, pressure independent type units, certified under ANSI/AHRI Standard 880 - 2011 Certification Program and carry the AHRI seal. Units shall be factory fabricated and tested. Selection shall be based on performance

characteristics that match or exceed those indicated on the drawings. Air terminal units include units used for supply air and general exhaust air.

2. Supply Terminal Units:

a. Basis of Design: The basis of design for supply terminal units shall be products manufactured by Titus, for single duct, dual, duct, or fan power unit applications, as indicated in the supply terminal unit model number schedule below.

b. Other Acceptable Manufacturers: Subject to compliance with requirements, provide terminal units of one (1) of the following:

- 1) Price Industries
- 2) MetalAire
- 3) Kruger
- 4) Environ Tech
- 5) Nailor

c. Supply Terminal Unit Model Number Schedule:

Manufacturer	Single Duct VAV	Fan Powered (FP) VAV
Titus	DESV	DTQP
Price	SDVQ	FDV
Metal Aire	TH-500	FVI-500
Krueger	LMHS	QFS
Environ Tech	SDR	N/A
Nailor	D3001/D30RW	D35N

d. Construction and Sound Ratings:

- 1) Terminal Casing: 22 gauge galvanized steel.
- 2) Internal Lining: Internal lining shall be a non - porous engineered polymer foam insulation closed foam fiber free (FF) cell insulation, 0.75 inch thick with a 'R' value three (3), fiberglass insulation will not be acceptable. Thermal conductivity shall meet or exceed 0.25 BTU - Inch / Hr. ft² @ 75°F. Insulation shall retain zero (0) moisture providing no support for bacterial or fungal growth and shall comply with the following: NFPA 90A, UL181 (Air Erosion), UL181 (Mold Growth and Humidity), UL723 (25/50 Flame and Smoke), ASTM E84 (25/50 Flame and Smoke), and CAN/ULC – 102.2-M88 (Flame and Smoke). Insulation shall be listed by Factory Mutual Research for compliance with all Codes, and Standards previously listed.

- 3) Discharge Connection: Galvanized steel slip and drive connections for square and/or rectangular ducts.
- 4) Casing Leakage: The unit casing shall be constructed to allow no more than 4 CFM while performing at one (1.0) inch inlet static pressure.
- 5) Damper: Heavy gauge steel with two (2) mechanical stops to prevent over stroking.
- 6) Damper Shaft: Solid steel with self-lubricating high density polyethylene bearings. Shaft shall be plainly marked to indicate damper position.
- 7) Damper Blade Seal: Full sheet synthetic to limit leakage to values specified in casing leakage data and no damper deflection.
- 8) Actuator: Factory mounted to the damper shaft and capable of providing a minimum of 35 lbs. of torque to the damper shaft. Refer to Automatic Temperature Controls for additional requirements.
- 9) Minimum Unit Static Pressure: The minimum static pressure required to operate each unit shall not exceed 0.13 inch wg for the basic unit with an inlet velocity of 2,000 fpm.
- 10) Integral Sound Attenuator (Except FP Terminal Units): Slip and drive discharge connection with 22 gauge galvanized steel casing with perforated metal liner and polymer enclosed acoustic media. The geometry of the silencer shall be designed for use with the Air Terminal to avoid added pressure drop and generated noise. Silencer/Air Terminal assembly shall be tested and performance certified in accordance with ASHRAE 130-2008 and AHRI 880-2011.
- 11) Sound Ratings: Include sound rating documentation in the submittal for each unit size. The maximum scheduled noise criteria (NC Level) is for discharge and radiated sound and shall not be exceeded in any of the 2nd through 7th octave bands at the scheduled inlet static pressure (min 1.50 inches, unless otherwise noted). For computation of the terminal unit NC values do not include manufacturer's standard cataloged attenuation credits. Include attenuation credits based solely on the actual design arrangement with respect to the layouts for ductwork and air devices served by each terminal as well as the actual room construction. Using the raw sound data from the terminal unit only, add credits based on the actual design, where the NC values exceed the scheduled noise criteria provide sound attenuators to meet the scheduled NC values.

e. Accessories:

- 1) Control Enclosure: Provide a factory mounted 22 gauge galvanized steel control enclosure with a removal cover to access the actuator, damper assembly and control components.

- 2) Coil Access: Provide a gasketed removable panel to access the air flow inlet side of reheat coil. Locate the access panel, for the reheat coil on the bottom of the terminal casing. Access panel shall not leak in excess of the posted rating under the casing leakage requirements listed above.
 - 3) Removable Air Flow Sensor: The air flow sensor shall be of a cross configuration located at the inlet of the assembly. The sensor shall have multi-point pressure sensing ports and a center averaging chamber designed to accurately average the flow across the inlet of the assembly. Sensor shall provide accuracy within 5% with a 90° sheet metal elbow directly at the inlet of the assembly so that straight lengths of duct are not required. Air flow sensor shall be removable for inspection and cleaning without disconnecting the inlet duct and/or the terminal unit as follows:
 - a) Titus Units: Sensor shall be removable from the bottom of the inlet connection regardless of unit's configuration.
 - b) Price Units: Sensor shall be removable from the side of the inlet connection depending on the unit's configuration.
 - c) Metal Aire Units: Sensor shall be removable from the side of the inlet connection depending on the unit's configuration.
 - d) Krueger Units: Sensor shall be removable from the side of the inlet connection depending on the unit's configuration.
 - e) Environ Tech Units: Sensor shall be removable from the side of the inlet connection depending on the unit's configuration.
 - f) Nailor Units: Sensor shall be removable from the side of the inlet connection depending on the unit's configuration.
 - 4) Induced Return Air Filter (Fan Powered Box Only): Not Required.
- f. Hot Water Heating Coils:
- 1) Casing: 20 gauge galvanized steel, factory mounted on terminal unit.
 - 2) Fins: Rippled and corrugated heavy gauge aluminum mechanically bonded to the tubes.
 - 3) Tubes: Tubes shall be constructed with a 0.016 wall thickness with male header and solder ends.
 - 4) Connections: Flanged or slip and drive.
 - 5) Testing: Leak test to 300 psi with minimum burst pressure of 2,000 psi.
 - 6) Performance: Meet scheduled capacity in accordance with ARI Standard 410.
 - 7) Rows: All coils shall be two (2) row, multi circuited coils.

g. Control Components:

- 1) All control components shall be furnished, and field installed by the BAS contractor, unless otherwise directed by UMB.

2.11 DUCTWORK AND ACCESSORIES

A. HVAC Material - Sheet Metal Ductwork and Accessories:

1. Sheet Metal Duct Work:

- a. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- b. Seal Class: Except as otherwise indicated, All ductwork shall be constructed to meet the requirements of SMACNA Seal Class A. Conform to the requirements in the referenced construction for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.
- c. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for the pressure classification as follows:
 - 1) Supply Ducts - Upstream of/Before Air Terminal Units: 6 inch wg. (Medium Pressure)
 - 2) Supply Ducts - Downstream of/After Air Terminal Units: 2-inch wg. (Low Pressure)
- d. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
- e. Cross Breaking or Cross Beading: Cross break or bead duct sides that are nineteen (19) inches and larger and are 20 gauge or less, with more than ten (10) sq. ft. of unbraced panel area, as indicated in SMACNA "HVAC Duct Construction Standard," Figure 1-4, unless they are lined or are externally insulated.
- f. Rectangular Duct Fittings: Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard," Latest Edition.

- g. Flexible duct work will be permitted at UMB provided the duct lengths do not exceed six (6) feet in length and are installed without sharp bends. Also Flex duct will be limited to connecting ceiling diffusers to branch ducts.
 - h. All sheet metal seams in new ductwork shall be sealed with mineral impregnated woven fiber tape as manufactured by Hardcast, Inc or other types of sealant materials.
 - i. Duct Connection Joint Sealant: Where new ductwork connects to existing ductwork provide the following material as a joint sealer between the new and existing duct surfaces:
 - 1) Permatite, Butyl gray non curing tape of sufficient width to seal the duct joints. Material can be purchased from the manufacturer or from Grainger using either the manufacturers model number DS5285, or the Grainger item number 2EJR3. Seal the external joints as required by these specifications and the ductwork can be placed in service.
- 2. Factory Fabricated Round Duct – Medium Pressure:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the manufacturers specified:
 - 1) McGill Air Flow Corporation.
 - 2) SEMCO Incorporated.
 - b. Round, Longitudinal- and Spiral Lock-Seam Ducts: Factory-fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards-Metal and Flexible." Fabricate ducts larger than seventy two (72) inches (1830 mm) in diameter with butt-welded longitudinal seams.
 - c. Duct Joints:
 - 1) Ducts up to twenty (20) Inches (500 mm) in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
 - d. Tees and Laterals: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards-Metal and Flexible," with metal thicknesses two gauge numbers heavier than specified for longitudinal-seam straight ducts.
 - e. Elbows: Use die-formed, gored, pleated, or mitered construction with bend radius of one and one half (1-1/2) times duct diameter. Fabricate to comply

with SMACNA's "HVAC Duct Construction Standards-Metal and Flexible," with metal thickness two (2) gauge numbers heavier than specified for longitudinal- seam straight ducts.

f. Branch Duct Connections: Provide branch duct connections for the following:

- 1) Round Connections: Where round ducts connect to medium pressure mains provide conical connections.
- 2) Non Round Connections: Where rectangular/square ducts connect to medium pressure mains provide connections with a 45 degree angle equal to the SMANCA "45 degree entry" fitting.
- 3) Rectangular/Square Manual Dampers: Where rectangular/square manual volume dampers connect to low pressure ductwork provide with a 45 degree angle,
- 4) Round Manual Dampers: Where round manual volume dampers connect to low pressure ductwork provide conical side tap connections.
- 5) Round Manual Dampers: Where round manual volume dampers connect to low pressure ductwork provide conical side tap connections.

3. Contractor Fabricated Round Duct – Medium Pressure: (Contractors Option)

- a. Round, Longitudinal- and Spiral Lock-Seam Ducts: Field-fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards-Metal and Flexible." Fabricate ducts larger than seventy two (72) inches (1830 mm) in diameter with butt-welded longitudinal seams.
- b. Duct Joints:
 - 1) Ducts up to twenty (20) Inches (500 mm) in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
- c. Tees and Laterals: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards-Metal and Flexible," with metal thicknesses two gauge numbers heavier than specified for longitudinal-seam straight ducts.
- d. Elbows: Use die-formed, gored, pleated, or mitered construction with bend radius of one and one half (1-1/2) times duct diameter. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards-Metal and Flexible," with metal thickness two gauge numbers heavier than specified for longitudinal- seam straight ducts.

4. Factory Fabricated Manual Volume Dampers:
 - a. Rectangular/Square Manual Volume Dampers – Low Pressure Ductwork: Provide manual volume dampers in low pressure duct systems where the system pressure does not exceed 2” wg and the air velocity is less than 1,500 fpm where shown on drawings and/or where needed for system balancing. Dampers shall be single blade and/or opposed blade type dampers as specified below:
 - 1) Single Blade Dampers Ductwork Less Than Twelve (12) Inches High: Dampers shall be Ruskin Model MD25 single blade type manual damper with a 24 gauge galvanized steel frame, a 22 gauge galvanized steel blade, molded synthetic bearings, three eighths (3/8) inch square axle shaft extending beyond the frame, factory supplied hand quadrant with wing nut, and a two (2) inch standoff bracket. Quadrant handle shall be inscribed with “closed”, “1/4 open”, “1/2 open”, “3/4 open” and “open”.
 - a) Size Range in Inches (W x H): 5 x 4 to 12 x10 or
 - b. Round Manual Volume Dampers – Low Pressure Ductwork: Provide manual volume dampers in low pressure duct systems where the system pressure does not exceed 2” wg and the air velocity is less than 1,500 fpm where shown on drawings and/or where needed for system balancing. Dampers shall be single blade type dampers as specified below:
 - 1) Single Blade Dampers Ductwork Twelve (12) Inches in Diameter or Less: Dampers shall be Ruskin Model MDRS25 single blade type manual damper with a 20 gauge galvanized steel frame, a 20 gauge galvanized steel blade, molded synthetic bearings, three eighths (3/8) inch square axle shaft extending beyond the frame, factory supplied hand quadrant with wing nut, and a two (2) inch standoff bracket. Quadrant handle shall be inscribed with “closed”, “1/4 open”, “1/2 open”, “3/4 open” and “open”. See example size range below and drawings for actual duct sizes and locations of runouts to diffusers.
 - a) Example Size Range in Inches (diameter): Four (4) inch to twelve (12) inch in diameter.
5. Contractor Shop Fabricated Manual Volume Dampers: (Contractors Option)

- a. Shop fabricated manual volume dampers must adhere to the same material and performance requirements specified for factory fabricated manual dampers.
6. Duct Sound Lining – Return Air Grilles with Sound Boots and Transfer Ducts Only:
- a. Duct sound lining shall be a minimum one (1) inch (25 mm) thick (unless otherwise noted), 1.5 pcf density fiberglass, minimum R-value of 4.2 (k-value 0.24 or better), complying with ASTM C 1071, ASTM G 21, ASTM G 22, NFPA 90A, NFPA 90B and UL 181. Duct lining shall contain an EPA registered antimicrobial agent which resists the growth of bacteria and fungi as proven by tests in accordance with ASTM G21 and G22. Liner noise reduction coefficient (NRC) shall be 0.70 or better. Surface of liner shall have water repellent properties. Duct liner shall be Certainteed Toughgard Product Type 150 or equivalent by Johns Manville, Knauf or Owens Corning. All duct sizes shown are clear inside dimensions.
 - b. Duct Liner Adhesive: Comply with Adhesive and Sealant Council, Inc. (ASC) and ASTM C916.
 - c. Duct Liner Fasteners: Comply with SMACNA Standards. Fasteners shall not compress liner by more than one eighth (1/8) inch.
7. Duct Access Doors:
- a. For Access to Terminal Unit Velocity Sensors provide Duct Mate Sandwich Type Access Doors. Access Doors shall be constructed of hot dipped galvanized steel panels with closed cell neoprene gasket bonded to the inside of the door. Gasket Material shall be rated for a service temperature range of -20°F to 200°F (ASTM D746) and shall be UL Listed (UL94HF1). Metal Panels shall be secured in place with zinc coated threaded bolts clinched and sealed to the inner panel and zinc coated springs between the inner and outer panels, and Red Molded Polypropylene Knobs with threaded metal inserts. Access Doors installed in the inlet duct to Terminal Reheat Units shall be insulated with High Density Fiberglass Insulation. Access Doors installed in the inlet duct to Exhaust Terminal Units do not require insulation. See Terminal Unit Details on Drawings for size and model numbers.

B. HVAC Material - Diffusers and Grilles:

1. Diffusers: Supply air diffusers shall be Titus, type TDC 22-gauge steel or aluminum diffuser with adjustable discharge, square or round neck, border type 3 twenty-four (24) x twenty-four (24) lay in module. and standard #26 white baked enamel finish. See drawings for diffuser size and capacities.
2. Return / Exhaust Grilles: Return and/or exhaust grilles shall be TITUS, type 25RL (Exhaust) and PAR (Return) 22-gauge steel or aluminum grilles, with square or rectangular neck, and border type 3 twenty-four (24) x twenty-four (24) lay in module. and standard #26 white baked enamel finish. See drawings for grille size and capacities.

C. Filter Media:

1. Return Air Grilles (RAG) with Sound Boots: Where return air grilles with sound boots are used in plenum ceilings in rooms served by Fan Powered Boxes provide two (2) inch MERV 1 filter media for each RAG.

2.12 INSULATION – PIPE AND DUCT SYSTEMS

A. General:

1. All pipe and duct systems shall be insulated with Owens Corning Insulation Products or approved equal by John Manville, Knauf Inc. or Pittsburgh Corning Corp. Foamglas.
2. Provide Tapes, Adhesives, Mastics and Sealants that are compatible with and approved by the insulation manufacturer.
3. HVAC Piping Systems include the following:
 - a. Hydronic Piping Systems: Includes Heating Hot Water Systems.

4. HVAC Duct Systems include the following:

- a. Supply Duct Systems: Medium Pressure and Low Pressure Duct Systems.

B. Piping Systems:

1. HVAC Heating Hot Water Piping Systems -100°F to 250°F:
 - a. Concealed and Exposed Interior Piping: Insulation for pipe sizes one half (1/2) inch to two (2) inches insulation shall comply with the following:
 - 1) Material: Fiberglass, Cellular Glass
 - 2) Thickness: One (1) inch
 - 3) Vapor Barrier: No

- 4) Field Applied Jacket – Concealed: None
- 5) Field Applied Jacket – MER Exposed: Glass Cloth
- 6) Field Applied jacket – Non MER Exposed: PVC
- 7) Pipe Fittings: “Zeston” pre molded fittings

C. Duct Systems:

1. HVAC Supply Duct Systems:

- a. Concealed Interior Supply Duct Systems: (Square, Rectangular, Round)
 - 1) Material: Fiberglass, Blanket
 - 2) Thickness: One and one half (1-1/2) inch
 - 3) Vapor Barrier: Yes
 - 4) Field Applied Jacket – Concealed: None
 - 5) Field Applied Jacket – MER Exposed: None
 - 6) Field Applied jacket – Non MER Exposed: None

2.13 BAS – AUTOMATIC TEMPERATURE CONTROLS

- A. General: Unless otherwise directed by UMB all work associated with the Building Automation System (BAS), including required demolition work shall be furnished and installed by the BAS Contractor. The BAS Contractor for this project shall be Siemens Bldg. Tech. Inc. No other manufacturers will be acceptable.
- B. Communication with third party products or products other than Siemens Apogee System: All products and/or devices that require software communication with the Siemens BAS shall be accomplished using BAC Net IP Communication Protocol.
- C. Terminal Unit Control Valves: Terminal units include Supply Terminal Units and Fan Powered Supply Terminal Units:
 1. Control Valves: All control valves shall be electronic type valves designed for quiet operation and 100% tight shut off against the system operating pressure. Valves concealed above suspended ceilings or in unit casings shall be packless type with bellows seals requiring no packing maintenance.
 2. Hydronic control valves (1/2 inch to 1 inch) for terminal units shall be globe type valves with bronze or forged brass body, NPT threaded ends, brass trim, type 303 stainless steel stem, metal to metal seat, ethylene propylene ‘O’ ring packing, ANSI Class 250, and selected to provide the scheduled gpm flow rate @ a maximum pressure drop of ten (10) feet. See equipment schedules for design flow rates. Valve type shall be one (1) of the following as selected by ATC:

- a. Valve Sizes 1/2 inch to 1 inch: Siemens Powermite MT Series valves for hydronic service.
 - b. Valve Sizes 1/2 inch to 2 inch: Siemens Flowrite Series valves for hydronic service.
- 3. Valve Fail Safe Position: Control valves fail safe position shall comply with the following:
 - a. Heating Valves Non Vivarium Areas – Fail Last Position: Upon a loss of a signal or power control valves and actuators used as reheat valves for terminal units shall fail in the last position.
- D. ATC Valve Actuators: Valve actuators shall be mounted on the valve body and shall provide complete modulating control of the valve. The actuator motor shall de-energize when the valve has reached the operator or system determined position. Each actuator shall be removable without removing the valve from service or draining the system. Actuators shall be electronic.
- E. Terminal Unit Fans: Verification of air flow for fans, which are part of terminal heating units (i.e.fan powered boxes) shall be by a current sensing device unless indicated otherwise on the point schedule.
- F. Temperature Sensors (DDC):
 - 1. General: Provide temperature sensors for controllers performing space temperature control. Sensors shall be wired thermistor type, with the following features:
 - a. Accuracy: + .5°F.
 - b. Operating Range: 35°F to 115°F.
 - c. Set Point Adjustment Range: 55°F to 95°F.
 - d. Calibration Adjustments: None required.
 - e. Installation: Up to one hundred (100) ft. from controller.
 - f. Auxiliary Communications Port: As required.
 - g. Set Point Adjustment Dial: As required.
 - h. Occupancy Override Switch: As required.
 - i. Terminal Jack: As required.
 - j. Cover: Blank cover, no display.
 - 2. Set Point Modes: Provide the following set point modes:
 - a. Independent Heating, Cooling.
 - b. Night Setback-Heating.
 - c. Night Setback-Cooling.

3. Auxiliary Communication Port: Each room temperature sensor shall include a terminal jack integral to the sensor assembly. The terminal jack shall be used to connect a portable operator's terminal to control and monitor all hardware and software points associated with the controller. RS-232 communications port shall allow the operator to query and modify operating parameters of the local room terminal unit from the portable operator's terminal.
4. Set Point Adjustment Dial: The set point adjustment dial shall allow for modification of the temperature by the building operators. Set point adjustment may be locked out, overridden, or limited as to time or temperature through software by an authorized operator at any central workstation, Building Controller, room sensor two (2) line display, or via the portable operator's terminal.
5. Override Switch: An override switch shall initiate override of the night setback mode to normal (day) operation when activated by the occupant and enabled by building operators. The override shall be limited to two (2) hours (adjustable.) The override function may be locked out, overridden, or limited through software by an authorized operator at the operator interface, Building Controller, room sensor two (2) line display or via the portable operator's terminal.
6. Room Sensors and Monitors: The following sensors for space control and/or space monitoring were indicated on the drawings and as required for proper control for the project:
 - a. Room Mounted Temperature Control Sensor: Room sensor shall come with a wall plate suitable for surface mounting in the room. The local setpoint adjustment shall be capable of being locked out by the BAS. The sensors shall be wired to the TEC by a cable which transmits the temperature signal to BAS.
 - b. Duct Mounted Supply Air Temperature Monitor: For each supply terminal unit serving a space, provide a duct mounted temperature sensor to monitor the supply and exhaust air temperature. The sensors shall provide an input for temperature monitoring range of 32°F to 122°F and be accurate to within $\pm 5^\circ\text{F}$ at mid range. The sensors shall be suitable for mounting on either a round or rectangular ductwork with self drilling screws and a gasket. The sensors shall be wired to the TEC by a cable which transmits the temperature signal to BAS.

G. ATC Wiring & Conduit:

1. Wiring and conduit necessary for all control work shall be provided by the ATC Contractor. All electrical work shall be in accordance with the National Electric

Code latest edition. All control cabling between the TEC and each room sensor shall be provided by the ATC Contractor. Electrical Contractor shall provide a one half (1/2) inch EMT between each TEC and room sensor.

2. All 110V power wiring for the control transformer shall be provided by the Division 26 Electrical Contractor from the circuit breaker to a junction box located near the control transformer. All 110V power wiring between the junction box and the control transformer shall be provided by the ATC Contractor.

H. Graphics and Programing – Existing Siemens System:

1. Graphics: For campus renovation projects, the BAS Contractor shall provide a graphics package as follows:
 - a. Existing Graphics: Where graphics exist in the Siemens System for the project, the BAS contractor shall either modify the existing graphics or replace the existing graphics with new graphics indicating the architectural changes to the project area and the locations of air terminal units or HVAC equipment and BAS sensors.
 - b. New Graphics: Where the Siemens System does not include graphics for the project, the BAS contractor shall provide a new graphics package for the project area indicating the architectural changes to the project area and the locations of air terminal units or HVAC equipment and BAS sensors.
 - c. New Graphics Background: Where new backgrounds are created by the BAS contractor these backgrounds must reside on and be compatible the Siemens Front End System and software. The BAS contractor can either create the background or utilize a CAD dwg file from the consultant or UMB as the background.
2. Programing: For campus renovation projects, the BAS Contractor shall provide the required programing as follows:
 - a. Existing Programing: Where programing exists in the Siemens System for the existing air terminal units or HVAC equipment that is either relocated, or removed and replaced, the existing building automation system programming shall be either modified or deleted, and a new program written by the BAS contractor to identify the air terminal units with the rooms they serve as part of the ATC work for the project.
 - b. New Programing: Where programing does not exist in the Siemens System for the existing air terminal units or HVAC equipment that is either relocated, or removed and replaced, the BAS contractor shall provide new programming to identify the air terminal units with the rooms they serve as part of the ATC work for the project. The new programing must reside on and be compatible the Siemens Front End System and software.

- c. Miscellaneous: Programming modifications shall also include the occupied and unoccupied modes of control for each terminal unit or lead/lag operation for HVAC equipment.

I. BAC Net IP Interface to the BAS:

- 1. Provide a patch panel and all required wiring as needed to connect the BAC Net IP based HVAC equipment to the BAS. Coordinate with UMB for the location of the panel in the building.

J. Air Terminal Units - Sequence of Operation (DDC):

- 1. Supply Terminal Reheat Units: The pressure independent variable volume supply terminal reheat units (STU) shall be controlled by an application specific DDC controller using electric actuation. Provide an auto zero module for each STU for periodic calibration of the controller's air velocity transducer. For supply terminal units, the calibration of the controller shall be programmed for the unoccupied mode. The space served by each STU is controlled in occupied and unoccupied modes as follows:

- a. Single Duct Terminal Units:

- 1) Occupied: The STU supplies a variable volume of supply air to the space. The controller monitors the air velocity sensor and modulates the supply air damper to maintain the supply air volume at the occupied set point. The controller monitors the room temperature sensor and modulates the reheat valve to maintain the space temperature at set point.
- 2) Unoccupied: The STU is controlled using the unoccupied temperature and minimum volume set point. The controller may reset to the occupied mode for a predetermined time period upon a signal from the control system.

- b. Fan- Powered Terminal Units:

- 1) Occupied: The space thermostat shall modulate the terminal unit primary air damper to maintain occupied space temperature setpoint and the fan shall be de-energized. On a fall in space temperature, the primary air damper shall modulate toward minimum position. When the primary air damper reaches minimum setting, and the space temperature continues to fall, the fan shall be energized. On a further drop in space temperature, the thermostat shall modulate the heating coil control valve to maintain space temperature setpoint. On a rise in space

- temperature, the opposite shall occur.
- 2) Unoccupied: The terminal unit primary air damper shall go to minimum setting. When the space temperature falls below the unoccupied setpoint, the heating coil control valve shall open, and the terminal unit fan shall energize. When space thermostat is satisfied the heating coil valve shall close and fan shall be de-energized.

K. Description – Input/Output Point Summary: For points not listed below and for software association, see sequence of operation. Points shall be able to integrate to trends and totalizations, as applicable. Additional points not specifically called for herein but required to perform the sequences as specified shall be provided at no additional cost to the Owner. Points labeled with * shall be trended.

1. Office Environment – Single Duct Supply Air Terminals: (VAV)

- a. Analog Inputs - Measured:
- 1) Space Temperature *
 - 2) Supply Air Temperature *
 - 3) Supply Air Flow – CFM *
 - 4) Supply Air Flow Min/Max Cooling and Heating *
- b. Analog Inputs Calculated:
- 1) Flow Calculated from Differential Pressure *
 - 2) Valve Position *
 - 3) Damper Position – Supply *
 - 4) Per cent (%) Flow – Supply *
- c. Digital Outputs:
- 1) Alarms – Temp, Flow and Pressure
- d. Analog Outputs:
- 1) Damper Control *
 - 2) Reheat Valve Control *
 - 3) Space Set Point Adjustment *
- e. System Features - Programs:
- 1) Night Setback
 - 2) Occupied/Unoccupied
 - 3) Trend *

2. Fan Powered Box:

-
- a. Analog Inputs - Measured:
 - 1) Space Temperature *
 - 2) Supply Air Temperature *
 - 3) Supply Air Flow – CFM *
 - b. Analog Inputs Calculated:
 - 1) Heating Valve Position *
 - 2) Damper Position – Return & Supply*
 - c. Digital Outputs:
 - 1) Alarms – Temp and Flow
 - d. Digital Input:
 - 1) Current Sensor for Fan Status*
 - e. Analog Outputs:
 - 1) Damper Control *
 - 2) Reheat Valve Control *
 - 3) Space Set Point Adjustment *
 - f. System Features - Programs:
 - 1) Night Setback
 - 2) Occupied/Unoccupied
 - 3) Trend *
3. System Features (Typical for ‘1’ & ‘2’ above):
- a. General:
 - 1) Color Graphics
 - 2) DDC Control
 - 3) Programming
 - 4) Trend
 - b. For points related to HVAC Systems coordinate with UMB and insert as directed.
4. BAS Networking and Point Identification: BAS contractor shall use the UMB Standard BAS Networking and Point Identification information and naming conventions for all project required networking and points. Include these requirements in the BAS Submittal. Contact UMB Building Automation Manager for additional requirements.

2.14 TESTING AND BALANCING

A. Testing and Balancing (TAB):

1. General: All TAB work shall be accomplished by an air balancing agency certified by AABC only. NEBB certified balancing companies will not be permitted.
2. Scope of Work: Balance the HVAC systems in the project area for air quantities and/or GPM flow rates indicated on the CD's. Acceptable results are where the actual measured values (cfm and/or gpm) are with-in +/- 10% of the design values.
3. TAB Report – Rough Draft: Identify the following:
 - a. Actual CFM and/or GPM results and compare them to the design requirements.
 - b. Identify any deficiencies and problems found in systems being tested and balanced.
 - c. Provide a list of deficiencies and problems to the CM along with any suggested corrections.
 - d. Where actual results are more than 10% below the design values submit an RFI.
 - e. When the deficiencies have been corrected rebalance the systems.
 - f. If the results are not acceptable repeat 'c' through 'e' until the results are acceptable, then see 'g'.
 - g. When the results are acceptable prepare a final TAB Report.
4. Final TAB Report: The TAB contractor shall submit one (1) electronic "pdf" file of the TAB report to engineer for review. TAB report shall bear the seal and signature of Test and Balance Engineer.

2.15 PROJECT OPERATION AND MAINTENANCE MANUAL – ELECTRONIC FILES

- A. Project O & M Manual File: The project OM Manual shall include one (1) electronic copy of each approved submittal and any manufacturer's maintenance manuals, and all warranty certificates included in this Division. Also include the address, phone number and contact person for each supplier. Using the UMB Standard O&M Manual Template referenced in Division 01 Closeout Procedures insert the submittal files include both a bookmark and tree structure for accessing each submittal file in the manual.

2.16 DUCT AND PIPE LEAK TESTING

A. Duct System Leak Test:

1. General: The Contractor conducting the test shall use this Test Procedure for all new duct systems. All new pressurized duct systems (positive and negative) shall be leak tested prior to the duct insulation being installed and/or the duct systems

being concealed in shafts and/or above hard ceilings where indicated on the drawings. Where duct systems are indicated to be concealed, these duct systems shall not be enclosed until each system as successfully passed its leak test. Test each duct system as a whole or in segments as required by progress of the work.

2. Duct Construction and Seal Class: All ductwork will be constructed to meet the requirements of SMACNA Seal Class A and shall be leak tested to meet the requirements of SMACNA Leak Class 2.
3. Leak Test Requirements: Unless otherwise directed by UMB, 100% of each non welded duct system shall be leak tested following the outlines and classifications in “The SMACNA HVAC Air Duct Leakage Test Manual” 2012 or latest edition or 1% duct leakage, whichever is greater. The total allowable leakage shall not exceed SMACNA Leak Class 2 for all duct construction. This UMB requirement exceeds standard SMACNA requirements.
4. Pre Test Procedure:
 - a. Prior to testing, the Sheet Metal Contractor shall manually remove all debris from inside ductwork, plenums, and equipment. Do not use Fans to remove the debris. Verify that all duct mounted equipment, access doors, accessories, components are installed complete as specified. Set all Fire Dampers, Smoke Dampers, or Combination Fire/Smoke Dampers in their proper position with “Fire Links” or other devices required for operation, in place and set.
 - b. Provide test blank off plates between each segment to be tested and provide access doors as specified to permit the removal of the blank off plates when the testing has been completed and approved by UMB.
5. Leak Test Procedure:
 - a. Close off and seal all openings in the duct section to be tested. Connect the test apparatus to the duct by means of a section of flexible duct.
 - b. Calculate the allowable leakage rate for the duct system or duct segment to be tested using the specified allowable leakage rate and the air volume
 - c. Start the blower with its inlet control damper closed.
 - d. Gradually open the inlet control damper until the pressure in the duct reaches the design duct operating pressure/class. Read and record the test pressure indicated on manometer (#1). Read and record the pressure differential across the orifice indicated on manometer (#2). Read and record

the duct leakage rate in CFM from the appropriate calibration curve. If there is no leakage, the pressure differential will be zero (0).

- e. If the test results indicate a leakage rate that exceeds the specified leakage rate the contractor and UMB Personnel shall survey all joints for audible leaks. Mark each location and repair the joints after shutting down the blower. After the sealant has set for at least twenty four (24) to thirty six (36) hours the contractor shall reschedule the test with all appropriate parties. Follow the procedures outlined in paragraphs 1, 2, 3 and 4 above. If the pressure test fails again the contractor shall repeat the entire process until the tested section passes the leak test.

B. Pipe System Hydrostatic/Leak Test:

1. HVAC Piping Systems: The following Pipe Systems shall be Hydrostatically Leak Tested by the contractor. All piping systems shall be proven tight in the presence of UMB Project Engineer prior to installation of insulation, and connection to exist piping systems. Provide all equipment and labor necessary for hydrostatically testing each system for one (1) hour at the minimum pressures as specified herein unless otherwise noted:
 - a. Heating supply/return piping 100 psig
 - * Cap and fill each system, with oil-free, dry nitrogen, to pressure of one and one half (1-1/2) times the system operating pressure, but not less than fifty (50) psig. Isolate the test source and let stand for four (4) hours to equalize temperature. Refill system, if required, to test pressure and hold pressure for one (1) hour with no allowable drop in pressure.
2. Systems using Pro-Press piping connectors shall perform a pre-test at 30 psi for ten (10) minutes. After the hydrostatic test pressure has been applied for ten (10) minutes and with no allowable drop in pressure, the tested system or segment has passed the Pro-Press leak pretest. If after the ten (10) minute test period there is a loss in pressure below the initial test pressure, the test has failed, and the contractor shall examine piping, joints, and connections for leakage. After all leaks have been corrected by tightening, repairing, and/or replacing components as appropriate, the hydrostatic test shall be rescheduled with the University. The test procedure shall be repeated as specified above until there are no leaks and there is no loss in pressure.

C. Hydrostatic/Leak Test Forms:

1. Contractors shall use the UMB Standard Leak Test Summary Forms for recording the leak test results for all duct and pipe systems tested on this Project as follows:

- a. Leak Test Duct Systems: See Part 3 for a sample of the UMB Standard Air Duct Leak Test Summary Form.
- b. Hydrostatic/Leak Test Pipe Systems: See Part 3 for a sample of the UMB Standard Pipe System Hydrostatic/Leak Test Summary Form.

PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS – EXECUTION

- A. All construction work that creates excessive noise will not be permitted during normal business hours. See Division 01 Specification Section “Cutting and Patching” for requirements.

3.2 CONNECTIONS AND ALTERATIONS TO EXISTING WORK

- A. When existing mechanical work is removed, all pipes, valves, ducts, etc. shall be removed back to the active pipe and duct mains and capped.
- B. Removal and/or relocation of existing services shall be closely coordinated with Facilities Management if they impact adjacent areas which shall remain operational.
- C. While performing connections and alterations to existing mechanical work, the contractor shall take extreme care to protect all existing materials, equipment, casework etc. from dirt, debris, and damage. Any damage caused by the contractor to existing materials, equipment, casework, etc. shall be repaired to UMB's satisfaction and specifications at the contractor's expense.

3.3 CUTTING AND PATCHING

- A. Cutting and patching associated with the work in the existing structure shall be performed a neat and workmanlike manner. Existing surfaces that are damaged by the contractor shall be repaired or provided with new materials to match existing.
- B. Structural members shall not be cut or penetrated. Holes cut through concrete and/or masonry to accommodate new work shall be cut by reciprocating or rotary, non-percussive methods.
- C. Patching of areas disturbed by installation of new work and/or required demolition shall match existing adjacent surfaces as to material, texture and color.

3.4 CUTTING, WELDING, BURNING

- A. Before the contractor and/or any sub-contractor commences any cutting, welding, burning or other type of hot work at UMB, the contractor must request a Hot Work Permit from the

UMB Office of the Fire Marshal. Hot Work Permits must be requested online at <https://www.umaryland.edu/fire-marshal/hot-work-permits/> at least one (1) day before beginning hot work.

- B. The hot work permit copy shall remain on the job site at the hot work location until such work is completed.

3.5 INSTALLATION – HVAC PIPING SYSTEMS

- A. Install all piping systems level and parallel to the building walls, and partitions. Diagonal runs are prohibited unless specifically indicated otherwise.
- B. Where horizontal piping offsets to clear obstructions such as ductwork, structural members and work installed by other trades provide drain valves and air vents in locations where they can be accessed.
- C. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- D. Install piping in concealed locations unless otherwise indicated.
- E. Install piping exposed in equipment rooms and service areas unless otherwise noted.
- F. Pipe Joints: Comply with the following:
 - 1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 - 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - 3. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
 - 4. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- G. HVAC Branch Pipe Connections: Install branch pipe connections off the top of the main pipe or on a 45-degree upward angle. Branch connections off the bottom of the main pipes are not acceptable.

3.6 PIPING SPECIALTIES

- A. Dielectric Connections:
 - 1. Install dielectric connections where piping of dissimilar metals and tubing are joined.
 - 2. Dielectric Connections for NPS 2 and Smaller: Use stainless steel threaded nipples.

3.7 INSTALLATION – PIPE SLEEVES

- A. Fire Rated Walls: Where new and/or existing plumbing piping passes through rated walls provide pipe sleeves with required fire sealant materials to maintain the rating of the wall assembly.
1. Use standard weight steel pipe or service weight cast iron pipe for pipe sleeves. Where sleeves are installed in floors and load bearing walls, use only standard weight steel pipe for pipe sleeves.
 2. Provide a minimum of one half (1/2) inch annular space clearance around the entire circumference of the pipe and/or insulation on cold piping passing through the sleeve and between the pipe sleeve and the surface of the core drilled hole.
 3. Center pipe passing through sleeve.
 4. Do not continue insulation through sleeve.
 5. The entire annular spaces must be sealed with fire and waterproof sealant Seal ends of pipe insulation and butt insulation ends up to fire stopping sealant in sleeve.
 6. Sleeves in walls must be installed flush with both finished wall surfaces.
 7. In finished areas provide an escutcheon plate around the bare pipe or insulated pipe passing through the assemblies to conceal the sleeve and sealant.
- B. Non-Fire-Rated Soundproof Partition Penetrations: Where pipes pass through interior partitions with sound proofing provide a pipe sleeve. Seal the annular spaces between construction openings, the sleeve, the pipe and/or pipe insulation with soundproof insulation material equal to the width of the opening. The soundproof insulation shall match the insulation in the partition.
- C. Sealant Requirements: Comply with requirements for sealants specified in Part 2.
- D. Fire-Barrier Penetrations: Comply with requirements for firestopping specified in Part 2.

3.8 INSTALLATION – VALVES

- A. Valves shall be placed in such manner as to be easily accessible for smooth and easy hand wheel operation and packing maintenance.
- B. Install valves in piping systems were shown on drawings, diagrams and details and where indicated below:
1. To Isolate:
 - a. Motorized flow control valves.
 - b. Equipment.
 - c. Branch piping.

2. To Drain:
 - a. Low points in piping systems.
 - b. Equipment.
 - c. Trapped sections in the piping system.
 3. To Balance:
 - a. Flow to coils.
- C. Shut off valves serving equipment and/or control valves shall be installed full size at the equipment connection.
- D. Where there is no interference, shut-off valves shall be installed with hand wheel located up on the horizontal runs of pipe to prevent accumulation of foreign matter in working parts of valves.
- E. On valves, strainers, etc., installed in copper piping, provide a union on the discharge side of each valve, and threaded adapters where copper piping connects to valves, strainers, etc.
- F. Where valves are installed in piping systems for pressure gauges, P/T plugs, DP Switches etc, for each device provide a one half (1/2) inch tap in piping systems less than one inch.
- G. Install drain valves at low points of risers and at trapped/low points in mains, branch lines, and everywhere else required to permit drainage of the entire piping system.

3.9 INSTALLATION – INTERIOR HANGERS AND SUPPORTS

- A. Piping Systems: Hangers and supports shall be provided for all piping systems, as recommended by the hanger manufacturers for the existing structural elements. Additional requirements are as follows:
1. On piping systems requiring insulation, hangers and supports shall be installed external to the insulation material, and sheet metal saddles shall be provided.
 2. Hangers and supports shall be provided at all changes of direction and elevations on piping system.
 3. Spacing shall be as recommended by manufacturer, for each pipe size and material type.
- B. Duct Systems: Hangers and supports shall be provided for all duct systems, as recommended by SMACNA for the existing structural elements. Additional requirements are as follows:

1. Spacing shall be as recommended by SMACNA, for each duct size and material type.
2. Support horizontal ducts within two (2) feet of each elbow and within four (4) feet of each branch intersection.

3.10 INSTALLATION – DUCT WORK

- A. Install all rigid ducts with support systems indicated in SMACNA “HVAC Duct Construction Standards,” Tables 4-1 through 4-3 and Figures 4-1 through 4-9.
- B. Install all ducts with the fewest possible joints.
- C. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.
- D. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- E. Horizontal Ducts: In finished spaces with suspended ceilings conceal the horizontal ducts above suspended ceilings.
- F. Non-Fire-Rated Partition Penetrations: Where ducts pass interior partitions and are exposed to view, conceal space between construction opening and duct and/or duct insulation with sheet metal flanges of same gauge as duct. Overlap opening on four (4) sides by at least one and one-half (1-1/2) inches.

Non-Fire-Rated Soundproof Partition Penetrations: Where ducts pass through interior partitions with sound proofing seal the annular spaces between construction openings, the sleeve, the duct and/or duct insulation with soundproof insulation material equal to the width of the opening. The soundproof insulation shall match the insulation in the partition.

- G. Fan Powered Equipment Connections: Connect ducts to fan powered terminal units with flexible connections. Comply with SMACNA “HVAC Duct Construction Standards,” for requirements.
- H. Branch Connections: Comply with SMACNA “HVAC Duct Construction Standards,” Figures 2-5, 2-6, 2-14 and 2-15.
- I. Seam and Joint Sealing: Seal duct seams and joints as follows:

1. Seal all transverse joints, longitudinal seams, and duct penetrations.
2. Seal externally insulated ducts prior to insulation installation.

3.11 INSTALLATION – PIPE AND DUCT INSULATION

A. Fiberglass Pipe Insulation:

1. All insulation shall be installed by a qualified insulation contractor. Insulation installed on cold surfaces shall have a vapor barrier and exposed ends shall be sealed. All insulation shall be installed and all seams, sealed, with Benjamin Foster sealant, according to manufacturer's recommendations.
2. Bond insulation to pipe with lagging adhesive.
3. Seal exposed ends with lagging adhesive.
4. Seal seams and joints with vapor barrier compound.
5. Where existing pipe insulation is disturbed for demolition work, and piping is capped, repair and seal damaged insulation.
6. Where existing pipe insulation is disturbed for demolition work, and new piping is connected at that location, butt new insulation up to the existing insulation and seal the joints as specified herein.
7. On new piping systems requiring insulation all pipe insulation shall be continuous through point of support. Provide sheet metal saddles between insulation and pipe hangers.
8. Where new piping connects to existing piping the new insulation shall match the thickness of the existing insulation.

B. Fiberglass Duct Insulation:

1. Install insulation tight and smooth to the duct surface.
2. Secure to ducts having long sides or diameters as follows:
 - a. Smaller than twenty four (24) inches: Apply bonding adhesive in six (6) inch wide transverse strips on twelve (12) inch centers.
 - b. Overlap the joints three (3) inches.
 - c. Seal joints, breaks, tears, and punctures with vapor barrier compound.

- d. Where existing duct insulation is disturbed for demolition work, and duct is capped, repair and seal damaged insulation.
- e. Where existing duct insulation is disturbed for demolition work, and new ductwork is connected at that location, butt new insulation up to the existing insulation and seal the joints as specified herein.

3.12 INSTALLATION – PIPE LABELS

- A. General: Provide pipe labels with directional arrows every twenty five (25) feet on straight runs of horizontal and vertical pipes exposed in equipment rooms, utility shafts and above ceilings. In addition to the referenced spacing above comply with the following:
 - 1. Where pipes pass through floors, walls and partitions provide pipe labels on each side of the penetration.
- B. Concealed Piping: Install pipe labels in accessible locations on the piping systems so they are visible from the point of access through the ceiling tile or ceiling access door.
- C. Directional Arrows: Install directional arrows to indicate the correct flow direction.
- D. All pipe labels and flow arrows that are found to be incorrectly installed shall be replaced and corrected at no additional cost to the project.

3.13 INSTALLATION – DUCT LABELS

- A. General: Provide duct labels every twenty five (25) feet on straight runs of horizontal and vertical exposed ducts in equipment rooms, utility shafts and above ceilings. In addition to the referenced spacing above comply with the following:
 - 1. Where ducts pass through floors, walls and partitions provide duct labels on each side of the penetration.
- B. Concealed Ducts: Install duct labels in accessible locations on the duct systems so they are visible from the point of access through the ceiling tile or ceiling access door.
- C. Directional Arrows: Install directional arrows to indicate the correct flow direction.
- D. All duct labels and flow arrows that are found to be incorrectly installed shall be replaced and corrected at no additional cost to the project.

3.14 INSTALLATION – BAS SENSORS

A. Room Sensors:

1. Wall Mounting Height: Wall mount sensor with the centerline @ forty eight (48) inches AFF and to the right of the room light switch with a two (2) inch space between the devices.

- B. Current Sensors: All motors serving HVAC fans shall be provided with a current sensor for “on/off” status to the BAS.

3.15 CLEANING AND FLUSHING

- A. General Requirement: The contractor shall secure the services of the water treatment company that is under service contract to UMB, to clean, flush and add chemical treatment to new piping systems that are required to be connected to existing piping systems serving the building or campus. The cost for labor and material for this work must be included in the contractors bid price. The contractor shall be responsible for the scope of work for the UMB water treatment company.

- B. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris; repair damaged finishes, including chips, scratches, and abrasions.

- C. Before adding chemicals to the system, isolate coils for heating and cooling equipment, and open bypasses.

D. Flushing portions of the system:

1. After a piping loop has been completed and prior to the installation of strainer baskets, flush that portion of the system. Connections shall be same size as piping being flushed, or one size smaller.
2. When a major section of the building has been completed, repeat the same procedure, except that pipe connections shall be limited to one and one half (1-1/2) inch.
3. Flushing shall remove sediment, scale, rust and other foreign substances.
4. After flushing, install strainers and pressure test system and make it tight.

- E. Chemical cleaning: Fill system with sufficient detergent and dispersant to remove dirt, oil, and grease.

1. Circulate for at least forty eight (48) hours.

2. Open a drain valve at the lowest point and bleed while the system continues to circulate. Assure that the automatic make-up valve is operating.
3. Continue until water runs clear and all chemicals are removed. Sample and test the water until pH is the same as pH of makeup water.
4. After chemical cleaning, remove strainers, clean and reinstall them.
5. Close bypasses and open valves to coils.

F. Submit certificate and test results to the UMB Project Manager.

3.16 FUNCTIONAL TESTING OF NEW HVAC SYSTEMS

A. Testing Preparation:

1. Certify in writing to the UMB testing agent that new HVAC systems, subsystems, and equipment have been installed, calibrated and are operating according to the Contract Documents.
2. Certify in writing to the UMB testing agent that new HVAC hydronic piping systems have been flushed and disinfected according to the Contract Documents.
3. Certify in writing to the UMB testing agent that new HVAC instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
4. Certify in writing that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.
5. Place new systems, subsystems, and equipment into operating mode to be tested (e.g., for supply terminal units, normal auto position, normal manual position, unoccupied cycle, alarm conditions).
6. Inspect and verify the position of each device and interlock identified on checklists.
7. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the UMB testing agent.

B. Tab Verification:

1. Notify the UMB testing agent at least ten (10) days in advance of testing and balancing Work and provide access for the UMB testing agent to witness testing and balancing Work.

2. Provide technicians, instrumentation, and tools to verify testing and balancing of new HVAC systems at the direction of the UMB testing agent.
 - a. The UMB testing agent will coordinate with the CM and TAB contractor to determine the date of field verification. Notice will not include data points to be verified.
 - b. The TAB subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.
 - c. Failure of an item includes, other than sound, a deviation of more than +/- 10%.
 - d. Failure of more than 10% of selected items shall result in rejection of final TAB report.
 - e. TAB contractor shall remedy the deficiency and notify the UMB testing agent so verification of failed portions can be performed.

C. General Testing Requirements:

1. Provide technicians, instrumentation, and tools to perform testing at the direction of the UMB testing agent.
2. Scope of HVAC testing shall include new HVAC installation, from the existing building systems through the new distribution systems to the renovated spaces. Testing shall include measuring capacities and effectiveness of operational and control functions.
3. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
4. The UMB testing agent along with the HVAC contractor, TAB Subcontractor, and HVAC Instrumentation and Control Subcontractor shall prepare detailed testing plans, procedures, and checklists for new HVAC systems, subsystems, and equipment.
5. Tests will be performed using design conditions whenever possible.
6. If tests cannot be completed because of a deficiency outside the scope of the HVAC system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

D. New HVAC Systems, Subsystems, and Equipment Testing Procedures:

1. Procedures: Where applicable follow manufacturer's written procedures. If no procedures are prescribed by the manufacturer, proceed as follows:
 - a. HVAC Piping Distribution Systems: Includes new hot water heating piping systems.
 - b. Verify that all new valves and accessories have been installed correctly, are accessible and operate as intended.
 - c. Verify that specified leak tests of piping systems are complete.
2. New HVAC Air Distribution Systems: Includes new supply, return and general exhaust duct systems.
 - a. Verify that all new ductwork, air devices, terminal units and accessories have been installed correctly, are accessible and operate as intended.
 - b. Verify that specified leak tests of duct systems are complete.
3. New HVAC Equipment: Includes new terminal units .
 - a. Verify that all new equipment has been installed in accordance with the manufactures recommendations and all equipment can be easily accessed for maintenance.
 - b. Verify that all new valves, trim, fittings, controls, and accessories have been installed correctly and operates as intended.
 - c. Verify that all new required interfaces with the BAS have been installed correctly and operates as intended.
 - d. Operate new equipment as intended to ensure the design conditions can be obtained.
4. New HVAC Building Automation System Interface:
 - a. Verify that all new control hardware and software, sequences of operations, and integration of factory controls has been installed correctly and operates as intended.
 - b. Verify that all new control valves, trim, fittings, and accessories have been installed correctly and operates as intended.
 - c. Verify that all new equipment test, training, and startup procedures have been completed per the specifications.
 - d. Verify that all new required interfaces between the BAS and HVAC equipment have been installed correctly and operates as intended.
 - e. Verify that all new control graphics and programming has been installed in accordance with the manufactures recommendations and operates as intended.
 - f. Operate new equipment as intended to ensure the design conditions can be obtained.

- g. Where existing terminal equipment and/or exhaust fans are reused and/or relocated verify related control components are installed as indicated.

3.17 CLEAN – UP

- A. Excessive debris and dirt, such as occurs from cutting through masonry or plaster walls shall be cleaned up from the equipment and removed immediately after the work of cutting through the walls.
- B. Debris shall be removed from UMB property.
- C. Ceiling panels shall be replaced as soon as work is finished in the area and shall be kept free of dirty fingerprints. Where work is being done in corridors used by patients and ceiling panels shall be replaced at the close of the day's work even if work is at the particular location is incomplete.
- D. All areas shall be left broom-clean at the end of the work period.
- E. Remove all mechanical clipping, wiring, nuts, bolts, etc. left on top of ceilings and ceiling tiles.

3.18 COMPLETED HYDROSTATIC/ LEAK TEST FORMS

- A. Upon completion of each hydrostatic/test, the contractor shall upload the signed leak test forms to the Project File, in ebuilder, in Folder 11.06 Test Reports.

3.19 UMB STANDARD HYDROSTATIC/LEAK TEST SUMMARY FORMS

- A. General: Contractors shall use the UMB Standard Forms for Recording the Hydrostatic/Leak Test Results for all Duct and Pipe Systems Tested on this Project.
 - 1. Pipe System Sample Form: See the following page for a sample of the UMB Standard Pipe System Hydrostatic/Leak Test Summary Form.
 - 2. Availability: The standard test summary form is available on the UMB Web Site at:
<https://www.umaryland.edu/designandconstruction/resources/contractors/>
 - 3. Field Testing: For field testing download and copy the forms from the UMB web site. Do not use attached "Sample Forms" for testing.

UMB STANDARD AIR DUCT SYSTEM LEAK TEST SUMMARY FORM

Project Name: _____ Project Number: _____ Page ____ of ____

Air System: _____ Specified Test Pressure: _____

Total System CFM: _____ Duct Construction Pressure Class: _____

Date of Test: _____

DESIGN DATA					FIELD TEST DATA RECORD				
Subject Duct	Surface Area (ft. ²)	Leakage Criteria			Measured CFM	Test Data ΔP (inches wg)	Test Result Pass/Fail	Test Performed By	Test Witnessed By
		Leakage Class	Leakage Factor (CFM/100ft.)	Test Section CFM					

UMB STANDARD PIPE SYSTEM HYDROSTATIC/LEAK TEST SUMMARY FORM

TEST DATA:

Date: _____ Project Number: _____

Location: _____

Pipe System Tested (Service): _____

Location and Description: _____

Pipe Materials: _____

Operating Pressure: _____

Specified Test Pressure: _____

Actual Test Pressure: _____

Pressure Test Type: _____

Test Start Time: _____ Recorded Test Pressure: _____

Test Completion Time: _____ Recorded Test Pressure: _____

Test Duration: _____ Pressure Drop or Rise: _____

Test Result (Pass/Fail): _____

SIGNATURES:

Construction Manager: _____

Construction Manager Representative: _____

Mechanical Contractor: _____

Mechanical Contractor Forman: _____

UMB Division: _____

UMB Witness: _____

Remarks: _____

END OF DIVISION 230000

DIVISION 260000 – ELECTRICAL

PART 1 – GENERAL REQUIREMENTS:

1.1 RELATED DOCUMENTS:

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

1.2 SCOPE:

- A. The electrical contractor shall furnish all labor, material, tools, equipment and services necessary and incidental for installing all electrical systems shown on the drawings, indicated in the specifications, or necessary to provide a finished installation. The finished installation shall be in perfect working condition and be ready for continuous and satisfactory operation. The project area is located in the School of Nursing, Floor 6.

1.3 CODES & REGULATIONS:

- A. All materials furnished and all work installed shall comply with the latest rules, regulations, and recommendations of the following bodies:
 - 1. International Building Code
 - 2. International Mechanical Code
 - 3. National Electric Code
 - 4. Maryland State Health Department
 - 5. National Fire Protection Association
 - 6. Fire Prevention Bureau Baltimore City
 - 7. Fire Protection Bureau State of Maryland
 - 8. Underwriters Laboratories
 - 9. National Electrical Manufacturer Association
 - 10. National Electrical Testing Agency
 - 11. Insulated Power Cable Engineers Association

1.4 RESPONSIBILITY

- A. The construction manager/general contractor (CM/GC) shall be responsible for all work included in Division 26. The delegation of work to contractors shall not relieve him of this responsibility. Contractors who perform work under these sections shall be responsible to the CM/GC.

1.5 SITE EXAMINATION:

- A. Failure to visit the site and become familiar with existing project conditions prior to bidding will not relieve the Contractor of responsibility for complying with the Contract Documents.

1.6 OUTAGES:

- A. For all work requiring an outage, the electrical contractor shall submit an outage request to the UMB Project Manager, using the UMB Standard Request for Outage Form which is available through the UMB Design and Construction Web Site at <https://www.umaryland.edu/designandconstruction/resources/contractors/>
- B. The existing electrical systems shall remain operational unless turned off by University personnel during the construction of the project. For each electrical outage request include a photograph of the panel index schedule for each panel affected by the outage.
- C. Unless otherwise specified, outages of any services required for the performance of this contract and affecting areas other than the immediate work area shall be scheduled at least ten business (10) days in advance with the UMB Design and Construction Department. Outages shall be performed during normal duty hours. If necessary, some outage work may be performed outside normal hours if approved by UMB.
- D. The electrical contractor shall include in his price the cost of all premium time required for outages and other work which interferes with the normal use of the building, which will be performed, in most cases, during other than normal work time and at the convenience of the University.
- E. The operation of electrical panels or power switches; required to achieve an outage must be accomplished by the university personnel only. Unauthorized operation of electric panels, power switches, by contractors their personnel will result in extremely serious consequences for which the contractor will be held accountable.

1.7 SUBMITTALS:

- A. General Requirements: For general requirements see Architectural Specification Division 01 Section "Submittal Procedures".
 - 1. After contract award and before material is ordered, submit electrically all shop drawings, drawings and such other descriptive data as the Engineer may require to demonstrate compliance with the contract documents as required by the contract clauses, plus the number required for himself and his subcontractors, for review and approval.
 - 2. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification

and paragraph reference, applicable publication references, years of satisfactory service, and other information necessary to establish contract compliance of each item the Contractor proposes to furnish.

3. All electrical equipment shall be approved and listed by Underwriters' Laboratories (UL) and shall bear nameplate indicating same.
4. Submittals will be reviewed for general compliance with design concept in accordance with contract documents, but dimensions, quantities, or other details will not be verified.

Submittals shall include the following items:

- a. Article 2.2, Fire Stops & Smoke Seals for Wall & Floor Sleeve Applications
 - b. Article 2.4, Raceway
 - c. Article 2.6, Boxes and Enclosures
 - d. Article 2.7, Wire and Cable
 - e. Article 2.8, Grounding
 - f. Article 2.9, Enclosed Switches and Disconnects
 - g. Article 2.10, Devices
 - h. Article 2.11, Identification
 - i. Article 2.13, Panelboards
 - j. Article 2.15, Lighting
 - k. Article 2.16, Indoor Occupancy / Vacancy Sensors
 - l. Article 2.17, O & M Manual
 - m. Warranties and maintenance instructions shall be included in the O & M Manual only. Do not include this data in the Submittals.
5. Submittal File Format: File formats and names for each submittal shall be electronically as follows:
 - a. File Formats:
 - 1) Product Data: “pdf” file format.
 - 2) Design Shop Drawings: “pdf” and “dwg” file formats.
 - 3) Coordinated Drawings: “pdf” or “dwg” file formats.
 - 4) Schedules: “xl” file format.

1.8 SAMPLES:

- A. Samples of materials to be used on the work shall be submitted when requested and shall be subject to approval by the A/E and the UMB Design and Construction Department.

1.9 REGULATIONS AND PERMITS:

- A. The Contractor shall obtain and pay for all permits, certificates of inspection, etc., required by the authorities having jurisdiction over this work. The certificates shall be delivered to the Engineer before the date of final acceptance of the project.

1.10 WORK PERFORMANCE

- A. All electrical work must comply with the requirements of NFPA 70 (NEC), NFPA 70B, NFPA 70E, OSHA Part 1910 subpart J, OSHA Part 1910 subpart S and OSHA Part 1910 subpart K in addition to other references required by the contract.
- B. Before initiating any work, a job specific work plan must be developed by the contractor. The work plan must include procedures to be used on and near the live electrical equipment, barriers to be installed, and safety equipment to be used and exit pathways.
- C. Job site and worker safety are the responsibility of the contractor. Compliance with the requirements of NFPA 70E is subject to ongoing inspection by University personnel and failure to comply will result in an immediate Stop Work order being issued and enforced at the contractor's expense.
- D. Energized electrical conductors and circuit parts to which an employee might be exposed shall be put into an electrically safe work condition before an employee performs work any time the employee is within the limited approach boundary or, where an increased risk of injury from an exposure to an arc flash hazard exists.
- E. Mandatory Requirements: The following requirements are mandatory:
 - 1. Protective Equipment: Electricians must use full protective equipment (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools, etc.) while working on energized systems in accordance with NFPA 70E.
 - 2. UMB Energized Work Permit: A UMB Energized Work Permit is required for any work on energized circuits or equipment. Permit must be approved by UMB Department of Operations and Maintenance prior to performing energized work. Submit the work permit with the outage request.

1.11 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of electrical products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- B. Installer's Qualifications: Electrical Installer shall submit the following evidence:

1. Five (5) comparable completed projects.
2. Copy of Maryland Master Electrician's License.
3. Local or State license where required.
4. BICSI and NICET certification, where required by these specifications.

1.12 IDENTIFICATION BADGES:

- A. Contractors must obtain photo identification cards for all employees who will be at the construction site. The University will charge the contractor twenty five dollars (\$25.00) for each badge as a deposit of which twenty dollars (\$20.00) will be returned when the badge is returned. Lost photo I.D. card will cost twenty five dollars (\$25.00) for another replacement card. (The above charges are subject to change without notice.)

1.13 HAZARDOUS MATERIALS:

- A. Identification and removal of hazardous materials (asbestos, lead paint, PCBs) is not part of this contract. If questionable material is encountered, notify the University Project Manager and the University Environmental Health and Safety in writing immediately. The University shall then arrange for investigation and possible abatement of the material. Contractor shall schedule his work to accommodate hazardous material removal by the Owner.

1.14 FUNCTIONAL TESTING OF NEW ELECTRICAL SYSTEMS

- A. Summary: This section includes the requirements for functional testing of electrical systems, assemblies and equipment related to the project area.
- B. Functional Testing will be performed by UMB staff
- C. Description: The following equipment and/or accessories shall be tested as part of this project:
 1. Branch panels.
 2. Lighting fixtures.
 3. AC motors.
 4. Lighting Controls.

1.15 GUARANTEE/WARRANTEE:

- A. All materials, equipment, etc. provided by the general contractor and/or his subcontractors shall be guaranteed and warranted to be free from defects in workmanship and materials for a period of two (2) years from the date of substantial completion and acceptance of work by UMB. Any defects in workmanship, materials, or performance which appear within the guarantee period shall be corrected by the contractor without cost to the owner,

within a reasonable time, to be specified by UMB. In default thereof, owner may have such work done and charge the cost of same to the contractor. In addition to the above statement the Guarantee/Warranty Period shall include all labor cost related to all warranty work. For compressorized equipment include an additional three (3) year Guarantee/Warranty Period. LED lighting fixtures and equipment include an additional five (5) year Guarantee/Warranty Period.

- B. The above shall not in any way void or abrogate equipment manufacturer's guarantee or warranty. Certificates of guarantee shall be delivered to the Owner.

PART 2 – PRODUCTS:

2.1 LISTED MANUFACTURERS:

- A. Listed Manufacturers: The manufacturers indicated in Part 2 represent the basis for design and identify the minimum level of quality for materials and equipment, specified in this Division, that are acceptable to UMB. Unless “or equal” is included as an option, substitutions are not allowed, except under the following condition. During bid phase, contractors may submit material and equipment by non-listed manufacturers provided said submittals meet the requirements of these specifications. All submitted materials and equipment are subject to approval by the A/E and UMB. Reference: Division 1 Substitution Section.

2.2 FIRE STOPS & SMOKE SEALS FOR WALL & FLOOR SLEEVE APPLICATIONS

- A. General: Provide fire stops, and smoke sealant materials for all electrical services penetrating through rated assemblies. See Architectural Specification Division 07, Section “Penetration Firestopping” for sealant material requirements. Services include:
 - 1. Electrical penetrations include conduits and cables.
- B. New Construction: All new penetrations shall be provided with a pipe sleeve and sealant materials.
- C. Existing Construction: All new service penetrations through existing rated assemblies shall be provided with a pipe sleeve and sealant materials. All existing unsealed penetrations for services passing through existing rated assemblies within the project area shall be provided with sealant materials.
- D. Project Area: The project area shall include the finished spaces and related sections of the utility shafts within the project area footprint.
- E. Wall Pipe Sleeve Applications: Pipe sleeves shall be required for all new conduit penetrations through rated wall assemblies and non-rated CMU walls. Where pipe sleeves

are installed in non-rated CMU walls fire rated sealant materials are not required. Provide acoustical caulking to seal the annular spaces between the sleeve and the bare pipe or pipe insulation on each end with one half (1/2) inch caulking all around the annular space.

- F. Floor Pipe Sleeves Applications: Pipe sleeves are required for all new conduit risers passing through floor slabs.

2.3 SLEEVES

- A. Steel Pipe Sleeves: Steel pipe sleeves shall be standard black steel pipe Type E, Grade B, with plain ends conforming to ASTM A53/A53M.

2.4 RACEWAY:

- A. For indoors above floor slab, use EMT conduit with compression fittings with a minimum size of three quarter (3/4) inch (regardless of function/purpose) and maximum size of two (2) inches. Above two (2) inches, conduit shall be rigid steel conduit, zinc coated with threaded type fittings.
 - 1. For low-voltage, special systems provide the following color-coated EMT raceway:
 - a. Fire Alarm - Red.
 - b. Telecommunications - Green.
 - c. Security - White.
- B. Flexible Metal Conduit: Provide flexible metal conduit for the following installations (consult the UMB Project Manager prior to using flexible metal conduit for any other locations):
 - 1. Vibrating Equipment (motors, etc.) – Limited to the last thirty six (36) inches prior to termination.
 - 2. Flexible connections to motors shall contain a 90 degree bend.
- C. Supports: For all indoor, conditioned-space locations utilize conduit clamps, conduit straps, bean clamps, etc. and/or channel strut supports. Support conduits at a minimum of two (2) times per ten (10) foot length and at a frequency rate as directed by the NEC.
- D. Bushings: Provide only threaded type for IMC, and RGS raceway. Provide only steel compression type for all EMT raceway systems. Provide insulated-throat, threaded type bushings for all tel/data raceway systems.

- E. All new raceways in finished areas shall be concealed unless specifically noted otherwise.
- F. Grout around all conduits at ceiling, floor, and wall penetrations to provide airtight seal. All fire-rated wall penetrations shall be sealed with a rated system/installation that is pre-approved by the UMB Fire Marshal. Submit manufacturer's engineering drawing of the proposed fire-proofing system to the UMB Project Manager for approval.
- G. Group together exposed conduit insofar as possible. Install all conduits parallel or perpendicular to the building surfaces. Maintain minimum six (6) inch spacing from parallel flues, steam pipes, or hot water pipes and two (2) inches from perpendicular flues, steam or hot water pipes.
- H. All conduits shall be rigidly supported to building structure. Conduits shall not be supported from suspended ceiling support wires.
- I. All conduit bends shall be made with an approved conduit bender and no bend shall have a centerline radius less than six times the diameter of the conduit.

2.5 BOXES AND ENCLOSURES:

- A. Indoor Applications: Provide NEMA 250 interior galvanized steel, minimum 14 gauge, outlet boxes, no less than four (4) inches square with extension rings and mounting brackets at the following locations:
 - 1. Dry and Clean Locations: NEMA Type 1.
 - 2. Locations with Dust, Falling Dirt and Dripping Noncorrosive Liquids: NEMA Type 12.
 - 3. Mechanical and Electrical Rooms: NEMA Type 12.
- B. Outlet boxes shall be rigidly and securely fastened in place. Outlet boxes in finished areas shall be flush mounted unless otherwise noted.
- C. Boxes shall be sized in accordance with NEC Article 370.
- D. All conduit connectors and entry hubs shall be insulated or have insulated bushings.
- E. Outlets shown adjacent to one another on the plans at the same mounting height shall be ganged except where noted.
- F. Outlets shown adjacent to one another on the plans at different mounting heights shall be located with the upper outlet centered directly over the lower outlet.

- G. GEM Boxes – Recessed GEM Boxes are prohibited.

2.6 WIRE AND CABLE:

- A. All wire shall be copper with insulation rated at 600 volts, 75°C minimum. **Aluminum wire is strictly prohibited.**
- B. Minimum wire sizes shall be #12 for power wiring, #14 for control wiring and as specially noted for systems wiring.
- C. Wire shall be solid type THHN or THWN up to size 10 AWG and stranded type THWN, XHHW, or THHN for size 8 AWG and larger. (Unless noted otherwise.) Do not use “BX” type cable (unless directed otherwise in writing by UMB Project Manager). For high temperature equipment connections use type TFE wire. Unless directed otherwise, do not exceed 40% conduit fill.
- D. MC Cable - Type steel-clad MC cable with separate, isolated ground conductor (i.e. do not use the jacket for the ground conductor) may be used in concealed locations for lighting and receptacle circuits or as otherwise directed on the contract drawings. Individual conductor color-coding scheme must follow color-code scheme described below. For renovation projects, the application of MC Cable shall mirror the standards followed for the building’s original electrical raceway system fit-out. Do NOT run MC Cable in exposed locations (e.g. all open ceiling locations, Mechanical and Electrical Equipment Rooms, IT Rooms, etc.).
- E. Type MC cable for branch circuit applications:
1. Interlocking galvanized steel armor, steel strip.
 2. Conductor insulation – THHN/THWN solid copper, 90 degree rated.
 3. Copper insulated green grounding conductor.
 4. Polyester assembly tape.
 5. Neutral conductor.
 6. Rated for use in plenums.
 7. Rated for through penetration of 1, 2, and 3-hour fire walls.
 8. UL 83, 1479, 1569, 1581, and 2556 listed.
 9. NEC 230.43, 250.118, 300.22, 392, 396, 330, 501, 502, 503, 530, 504, 505, 518, 530, 645, 725, 760, 760.154(A) compliant
 10. AFC Type MC, MC-Tuff Lightweight Steel
- F. Fire Alarm Control Cable Type MC
1. For use on fire alarm circuits as required and as recommended by the manufacturer.
 2. Interlocking galvanized steel armor, steel strip (painted red).

3. Conductor insulation – TFN/THHN solid copper.
4. Copper grounding conductor.
5. Polyester assembly tape.
6. Neutral conductor.
7. UL Listed Fire Alarm Cable.
8. Rated for use in plenums.
9. Rated for through penetration of 1, 2, and 3-hour fire walls.
10. Individual twisted pairs and shielding, as required per fire alarm system manufacturer.
11. UL 66, 83, 1424, 1569, 1581, and 2556 listed.
12. NEC 300.22, 362, 330, 430.2, 501, 502, 503, 530, 504, 505, 518, 530, 645, 725, 760, 760.154(A) compliant
13. AFC Type MC Fire Alarm/Control Cable.

G. MC Cable Installation Requirements:

1. Install in compliance with NFPA 70.
2. Locations: In dry wall partitions and above accessible ceilings. Do not install in masonry partitions or walls.
3. Independently support all MC Cable runs; do not piggy-back on plumbing/HVAC, lighting fixture, and/or ceiling grid supports.
4. Do not bundle more than three (3) runs together for supporting purposes.
5. MC cable shall be installed in a neat and orderly fashion using batwings type supports.
6. Minimum bend radius shall be as recommended by the manufacturer.
7. MC cable run to switches shall have a neutral conductor.
8. Cable larger than #8AWG shall not be permitted.
9. All acceptable homeruns from panels in electrical rooms shall be installed in EMT conduit to a junction box/wire trough outside electrical rooms in accessible ceiling of corridor.
10. Homeruns from panelboard to junction box outside of electrical room: wire in EMT or IMC raceway.
11. Do NOT run MC Cable in exposed locations (e.g. all open ceiling locations, Mechanical and Electrical Equipment Rooms, IT Rooms, etc.).
12. MC cable shall be secured at intervals not exceeding six (6) feet and within twelve (12) inches of every outlet box or fitting. Luminaire whips may be six (6) feet maximum without support.

H. Molded connectors (wire nuts) may be used for splicing size 10 AWG or smaller wires on lighting and receptacle circuits only. “Scotch Blocks” must be submitted for prior approval. All other wiring shall be spliced only with lugs and/or terminal blocks.

I. Terminal lugs shall be mechanical clamp or compression type unless part of a circuit breaker or switch assembly.

- J. Special lugs may be required to accommodate conductor sizes shown on the drawings. Contractor shall verify lug requirements for all circuit breakers and equipment terminals and shall provide correct lugs as required.
- K. Pre-insulated crimp connectors and terminals shall be used on alarm wiring.
- L. Under no circumstances shall feeders be spliced and/or tapped.
- M. Lighting and receptacle branch circuit homeruns over one hundred (100) feet long shall be size 10 AWG minimum.
- N. Color code the entire power wiring system as follows:
 - 1. 120/208 Volt System
 - a. Phase A - black
 - b. Phase B - red
 - c. Phase C - blue
 - d. Neutral - white
 - e. Ground - green
 - 2. 277/480 Volt System
 - a. Phase A - brown
 - b. Phase B - orange
 - c. Phase C – yellow
 - d. Neutral - gray
 - e. Ground - green

2.7 GROUNDING:

- A. Provide a complete equipment safety ground system ("green wire" ground) for the entire electrical system as required by Article 250 of the NEC, and as specified herein.
- B. Provide additional grounding as indicated on the plans.
- C. All grounding wire, lugs, jumpers and bus shall be copper.
- D. All feeder and branch circuits shall contain an equipment ground wire. No conduit or raceway of any kind or length shall be used as the equipment grounding conductor.
- E. Equipment grounding conductors and straps shall be sized in accordance with the NEC. Refer to feeder schedules for ground wire requirements which may exceed the NEC. All equipment grounding conductors shall be provided with green insulation equivalent to the insulation on the associated phase conductors.

- F. The equipment grounding system shall be installed so all metallic structures, enclosures, raceways, piping, systems, junction boxes, outlet boxes, cabinets, machine frames and portable equipment frames operate continuously at ground potential and provide a low impedance path for ground fault currents.
- G. Where parallel feeders are used, each raceway shall contain an equipment ground conductor sized in accordance with NEC 250 for the combined parallel circuit amperage.
- H. Grounding conductors shall be continuous, and no splicing shall be allowed.
- I. Receptacles shall be bonded to their outlet boxes with #12 copper straps.

2.8 DEVICES:

- A. All wiring devices shall be Specification Grade.
- B. The Contractor shall verify color, location and mounting height of all devices prior to installation.
- C. Receptacles shall be flush, duplex, grounding type, 20A, 2P, 3W, 125VAC, NEMA 5-20R straight blade, ivory nylon or high-strength thermoplastic material unless indicated as special purpose outlet. Receptacles shall be designed to accept standard two-wire parallel connector caps and shall grip both sides of the connector wire.
- D. Single throw lighting switches shall be quiet type, 20A, 1P, 120/277VAC, ivory handle able to accommodate up to #10 conductors and designed for inductive lighting loads. For renovation projects, match existing switches.
- E. Three (3) way and four (4) way toggle switches shall be quiet type, 20A, 120/277VAC, ivory handle. Switches shall be positive action type and shall not permit a maintained neutral position. For renovation projects, match existing switches.
- F. Convenience receptacles serving bathrooms, toilets, outdoor and wet locations and construction sites shall be ground fault (where required by the NEC) interrupter type, 20A, 2P, 3W, 125VAC, NEMA 5-20R, straight blade, ivory handle or high-strength thermoplastic material.
- G. Provide 0.04 inch thick satin finish, Type 302, stainless steel plates at all receptacle and switch outlets unless otherwise specified. Provide galvanized steel plates in unfinished spaces.
- H. LED Dimmer Switch shall be compatible with LED lighting fixture dimming driver.

1. Switch Type as indicated on the drawings.
 2. Dimming Control: 0-10VDC: 200mA Sink, Sink Dimming.
 3. Electrical Ratings: 120 VAC, Maximum Load: 10 amps, 1200W, 60 Hz – 277VAC, Maximum Load: 6 amps, 1660W, 60 Hz.
 4. Light Intensity Control: Full-range, continuously variable dimming. Adjustable High-level trim setting.
 5. Power Failure Memory: Light returns to same level prior to power interruption.
 6. Wiring Type: As recommended by manufacturer.
 7. Flammability: Meets UL 94 requirements, V2 rated.
 8. Temperature: -4°F to 158°F.
- I. Receptacles shall be mounted with the bottom of the receptacle 18 inches above the finished floor unless otherwise noted. Gang multiple outlets at one location under a single multi-gang cover plate.
- J. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
- K. Switches shall be vertically aligned with Thermostats, other wall switches, fire alarm devices with the top of the switch 48 inches above the finished floor unless otherwise indicated. Notify engineer of any discrepancies before roughing in outlet and obtain a new location. Gang multiple switches at one location under a single multi-gang plate. Locate switches on strike side of door between six (6) inches and twelve (12) inches from edge of door frame.
- L. Device plates shall be fitted tight to the wall.
- M. Delay installation of device plates until painting is complete.
- N. Provide RED devices when supplied by emergency power. Coordinate with UMB Project Manager to confirm. For special type receptacles on emergency power, provide RED cover plate.
- 2.9 IDENTIFICATION:
- A. Coordinate names, abbreviations and other designations used in electrical work with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical systems and equipment.
 - B. Delay installation of identification until painting is complete.

- C. Comply with governing regulations and requests of governing authorities for identification of electrical work.
- D. Where electrical conduit is exposed, apply identification (e.g. noting voltage, service/signal type, emergency power, etc.) on conduit. Except as otherwise indicated, use permanent vinyl, self-adhering markers with black letters on orange background.
- E. Apply self-adhering vinyl or heat-shrink plastic cable/conductor identification markers on each cable and conductor in each box, enclosure or cabinet where wires of more than one circuit are present, except where another form of identification (such as color-coded conductors) is provided. Match identification with marking system used in panelboards, shop drawings and contract documents.
- F. Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical systems and electrically connected mechanical systems, install self-adhesive plastic signs with appropriate instructions or warnings. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposes.
- G. Install warning signs at the entrances to all rooms and spaces in which electrical conductors or equipment are installed (white letters on red background).
- H. All field installed control circuits shall have tubular sleeve-type wire markers at each end of the circuit and at all splice points. Wire markers shall be permanently stamped with a numbering system selected by the Contractor. The numbering system shall be thoroughly documented and provided to the Engineer.
- I. Each receptacle shall be neatly marked on the inside cover with indelible marker identifying the panel and breaker from which it is fed and durable markers or tag inside outlet box. This to ensure the correct covers are restored after room renovations and/or painting. In addition to marking circuit identification inside the cover, also provide laminated label with circuit number on device cover plates.
- J. Dymo (or equivalent) labels shall not be used.
- K. Ceiling Markers: Provide labels on ceiling grid for accessible electrical equipment that is installed above the ceiling.

2.10 PANELBOARDS:

- A. Branch Circuit Breakers: Provide only bolt-on type branch circuit breakers of the ambient-compensated, thermal-magnetic type, which will provide inverse time delay overload and instantaneous short circuit protection. Voltage and current ratings as indicated on the contract drawings. Plug-in and/or tandem breakers are prohibited.

- B. Provide a typewritten directory for each panel, placed inside the panel door. The directory shall list all rooms served by each breaker, using the "Owner's" room numbers. Directories shall be installed in a metal directory frame with clear protective cover. Spares and spaces shall be written in pencil.

2.11 LIGHTING:

- A. Provide LED lighting fixtures of the sizes, types and ratings indicated on the drawings and in the schedules. Fixtures shall be complete with housings, energy efficient lamps, lamps/drivers, lenses, louvers and reflectors. LED lighting fixtures scheduled on the drawings are found to offer products similar to the basis of design product, including performance, appearance, and quality. Listed equals must comply with minimum performance criteria. Additional documentation and calculations for LED lighting fixtures compliance should be made available upon request.

- B. Exit Signs:

- 1. General Requirements for Exit Signs: Comply with UL 924; for, visibility, luminance, and lettering size, comply with authorities having jurisdiction. Provide RED color sign.

- C. LED Lighting Products:

- 1. Luminaires:

- a. Refer to Luminaire Schedule for specified parameters such as correlated color temperature (CCT) value(s), lumen output, efficiency, etc.
 - b. Products shall be fabricated to be Reduction of Hazardous Substances (RoHS) compliant.
 - c. Must maintain their warrantied life while operating within the manufacturers' specified environmental parameters.
 - d. The lumen value specification listed in the Luminaire Schedule is a delivered lumen value specification. Products supplied shall deliver not less than the lumen value specified.
 - e. The lumen maintenance specification of any assembled LED based chip, array, module, driver, and luminaire combination shall be a minimum of L70, at fifty thousand (50,000) hours, as tested and measured in compliance with IES documents LM-79 and LM-80.
 - f. Except as otherwise stated in the Luminaire Schedule, the light source shall provide a minimum CRI of 80.

- 2. Acceptable Manufacturers:

- a. Refer to the Luminaire Schedule.
3. Drivers: Listed and so labeled per UL 8750 and UL 1310, and shall meet or exceed the following general specification criteria:
- a. Designed and tested to be compatible with the luminaire light source operating current, voltage, and output power requirements.
 - b. Inaudible above 27 dBA ambient sound level.
 - c. Designed, fabricated, and tested to operate at an input voltage of 120 – 277VAC, $\pm 10\%$, at 60 Hz, with no perceptible change in light source output.
 - d. Contribute less than 20% total harmonic distortion, operating at full rated load, and shall not exceed the maximum allowable THD requirements allowed per standard ANSI C82.11.
 - e. Provided with integral short circuit, open circuit, and overload protection.
 - f. Have an operating power factor ≥ 0.9 .
 - g. Limit conducted and radiated interference in compliance with FCC 47 CFR Part 15.
 - h. Housed in a UL compliant and listed enclosure, suitable for remote installation where required, and listed for installation within spaces used for environmental air (plenum), as defined in NFPA 70 – the National Electrical Code.
 - i. Acceptable Manufacturers:
 - 1) Cree.
 - 2) EldoLED.
 - 3) Philips/Advance.
 - 4) Thomas Research Products.
 - 5) Or as supplied by the luminaire manufacturer, in compliance with these Specifications.
4. Dimmable Drivers - In addition to the general specification criteria specified above:
- a. Have an operating power factor of ≥ 0.9 at full load, and not less than 0.8 at dimmed level.
 - b. Provide smooth, flicker-free, dimmable light output from 100% to less than 1%.
 - c. 0-10VDC "sinking" type dimming control protocol per enforced version of IEC Standard 60929, unless otherwise noted or required.
 - d. Acceptable Manufacturers:
 - 1) Cree.
 - 2) EldoLED.
 - 3) Philips/Advance.
 - 4) Thomas Research Products.

- 5) Or as supplied by the luminaire manufacturer, in compliance with these Specifications.
- D. Fixtures shall be secured to structural supports and shall not rely on ceiling systems for support. Pendant fixtures shall be plumb and level. Pendant mounted fixtures, larger than two (2) feet shall be installed with two (2) stem hangers. Stem hangers shall have ball aligners and provisions for minimum one (1) inch vertical adjustment. Plaster frames shall be provided for all recessed fixtures, installed in other than a suspended access ceiling system.
- E. Surface mounted fixtures greater than two (2) feet in length shall be supported from at least one point in addition to the fixture outlet box stud.
- F. Set, aim and adjust adjustable fixtures in accordance with instruction and guidelines provided by the Architect. Adjust light level of photo control relays in accordance with instructions from the Architect.
- G. Lighting Control: Provide lighting control as directed on the contract drawings.

2.12 INDOOR OCCUPANCY/VACANCY SENSORS:

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Lithonia Lighting, Acuity Lighting Group, Inc.
 2. Sensor Switch, Inc.
 3. Leviton.
 4. Lutron.
- B. General Description: Wall- or ceiling-mounting, solid-state multi technology units with a separate relay unit.
 1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of one (1) minute to fifteen (15) minutes.
 2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, and Class 2 power source as defined by NFPA 70.
 4. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a one half (1/2) inch knockout in a standard electrical enclosure.

- c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 - 5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
 - 6. Bypass Switch: Override the on function in case of sensor failure.
 - 7. Automatic Light-Level Sensor: Adjustable from two (2) foot candles to two hundred (200) foot candles; keep lighting off when selected lighting level is present.
 - 8. Auxiliary Contacts: Ceiling mounted occupancy sensors shall have two sets of dry contacts.
- C. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.
- 1. Sensitivity Adjustment: Separate for each sensing technology.
 - 2. Detector Sensitivity: Detect occurrences of six (6) inch-minimum movement of any portion of a human body that presents a target of not less than thirty six (36) square inches, and detect a person of average size and weight moving not less than twelve (12) inches in either a horizontal or a vertical manner at an approximate speed of twelve (12) inches/s.
 - 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of one thousand (1,000) square feet when mounted on a ninety six (96) inch high ceiling.

2.13 PROJECT OPERATION AND MAINTENANCE MANUAL – ELECTRONIC FILES

- A. Project O & M Manual File: The project OM Manual shall include one (1) electronic copy of each approved submittal and any manufacturer's maintenance manuals, and all warranty certificates included in Division 27. Also include the address, phone number and contact person for each supplier. Using the UMB Standard O&M Manual Template referenced in Division 01 Closeout Procedures insert the submittal files include both a bookmark and tree structure for accessing each submittal file in the manual.

PART 3 – EXECUTION:

3.1 GENERAL REQUIREMENTS – EXECUTION

- A. All construction work that creates excessive noise will not be permitted during normal business hours. See Division 01 Specification Section "Cutting and Patching" for requirements.
- B. General provisions of the contract apply. All work performed and materials provided shall conform to all applicable codes and standards and the National Electrical Code (NEC).

- C. Prior to starting work, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- D. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing all doors and passageways.
- E. Confirm the locations of all existing utilities. Repair any damage to existing utilities caused by construction forces.
- F. Leave all areas broom clean daily. Remove all construction debris and trash from the site daily.
- G. Before ordering any materials or equipment, submit to the engineer data for all materials and equipment. Check equipment dimensions of proposed substitute equipment. The cost of any redesigning caused by a substitution shall be borne by the Contractor.
- H. Contractor shall do all cutting, drilling and patching required by his work. All repairs to finish shall be of like kind, color and quality as existing. Structural members shall not be cut without approval from the architect.
- I. Provide temporary power as may be required for construction or as may be required to maintain critical operations during changeover of feeders or services. Provide all equipment, make all arrangements, and make all connections required for temporary power. Remove all provisions for temporary power upon completion of the project.
- J. Schedule in advance all outages of building utilities. Outages shall be as short as possible. All services shall be restored and placed in operation when Contractor's personnel leave the site each day.
- K. Take necessary precautions to protect building's occupants and contents and prevent the spread of dust and dirt into occupied areas.
- L. Electrical contractor shall identify existing circuits and existing panels for the renovation area and trace and identify existing circuits. Identifying and tracing of the circuits shall be done with machinery and appropriate safety gear. Should an outage become necessary, it will need to be requested a minimum of ten (10) working days in advance through the UMB Project Manager.
- M. Contractor shall update panel board circuit directory cards. Contractor shall also provide an electronic copy of new and/or revised schedule in excel or word format to Operations & Maintenance work management system thru Director of Operations & Maintenance.

3.2 SLEEVES

- A. Non-Fire-Rated Soundproof Partition Penetrations: Where new and existing conduits pass through interior partitions with sound proofing provide a pipe sleeves. Seal the annular spaces between construction openings, the sleeves, and conduits with soundproof insulation material equal to the width of the opening. The soundproof insulation shall match the insulation in the partition.

3.3 CONTRACT DOCUMENTS:

- A. Contract drawings for electrical work are diagrammatic, intended to convey scope and general arrangement.
- B. Correction of faulty work due to resolving discrepancies without authorization shall be the responsibility of the Contractor.
- C. Should the Contractor discover any discrepancies or omissions on the drawings or in the specifications, he shall notify the Engineer of such conditions prior to the bid date. Otherwise, it will be understood that the drawings and specifications are clear as to what is intended and shall be as interpreted by the Engineer.

3.4 COORDINATION:

- A. Coordinate all work and cooperate with all other trades to facilitate execution of work.

3.5 FIELD INSTRUCTION:

- A. Upon completion of work, instruct Owner's representative in the proper operation and maintenance of the electrical systems.

3.6 DEMOLITION:

- A. The electrical demolition in the renovation areas indicated on the drawings shall be complete and include all electrical work in the area unless noted otherwise.
- B. Existing electrical systems passing through areas of demolition to serve equipment beyond the demolition areas shall remain in service, or be suitably relocated and restored to normal operation, throughout the demolition and reconstruction of the area. The Contractor shall investigate and identify such equipment prior to demolition.
- C. Provide temporary electrical service to equipment disturbed by the demolition until such time as the permanent service can be restored.

- D. Where conduit and wiring to remain are inadvertently damaged or disturbed, cut out and remove damaged portion and all damaged wiring from the source switchboard, panelboard or pull box to the destination connection point. Provide new wiring of equal capacity.
- E. Exposed conduit to be demolished shall be removed in its entirety. Concealed conduit, abandoned in place, shall be cut out approximately two (2) inches beyond the face of adjacent construction, plugged, and the adjacent surface patched to match existing.
- F. Wiring to be demolished shall be removed from both concealed and exposed conduit. No wiring which becomes unused as a result of the contract shall be abandoned in place.
- G. Equipment specified or indicated to be demolished, shall be removed from the project site and shall not be reused.

3.7 TESTING:

- A. Thoroughly clean the electrical equipment and associated electrical materials before energization of any part of the electrical system. It is the Contractor's responsibility to have all the electrical equipment, raceways, cabling, cable insulation and other related electrical systems tested. All test results shall be recorded, dated and submitted to the Engineer and Owner for record. Test procedures and results shall be per NETA standards. In the absence of relevant NETA standards, the Contractor shall substitute appropriate test procedures from IEEE or ANSI. The substitute test procedures shall be submitted to the engineer for approval before conducting the tests.
- B. During the course of and after completion of installation, the Engineer shall:
 - 1. Inspect the installation, workmanship, testing and operation of key electrical systems.
 - 2. Key electrical systems include:
 - a. Panels
- C. The Contractor shall verify that each key system interfaces correctly with all related systems. The Contractor shall furnish all test data to the Engineer verifying that all systems have been installed correctly and work together to provide a completely operational electrical power system as designed.
- D. The Engineer reserves the right to accept or reject test data which does not conform to the manufacturer's data or is not obtained in accordance with these specifications.

3.8 FUNCTIONAL TESTING OF NEW ELECTRICAL SYSTEMS

A. Testing Preparation:

1. Certify in writing to the UMB testing agent that electrical systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
2. Place systems, subsystems, and equipment into operating mode to be tested.
3. Inspect and verify the position of each device and interlock identified on checklists.
4. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the UMB testing agent.

B. General Testing Requirements:

1. Provide technicians, instrumentation, and tools to perform testing at the direction of the UMB testing agent.
2. Scope of electrical testing shall include all lighting controls.
3. Test all operating modes and verify proper response of controllers and sensors.
4. The UMB testing agent along with the lighting contractor shall prepare detailed testing plans, procedures, and checklists for applicable new lighting systems, subsystems, and equipment.
5. Tests will be performed using design conditions whenever possible.

C. Electrical Systems, Subsystems, And Equipment Testing Procedures:

1. Procedures: Where applicable follow manufacturer's written procedures. If no procedures are prescribed by the manufacturer, proceed as follows:
 - a. Electrical Distribution Systems: Includes existing and/or new panels and circuit breakers for power and lighting.
 - b. Verify that all new panel components have been installed correctly, are accessible and operate as intended.
 - c. Where existing panel spares are used for new circuits verify the installation is correct and the panel index has been revised.
 - d. Verify that specified tests are complete.
2. Electrical Equipment: Includes new lighting and controls where indicated.
 - a. Verify that all new equipment has been installed in accordance with the manufactures recommendations and all equipment can be easily accessed for maintenance and operates as intended.

- b. Verify that all new connections, controls, and accessories have been installed correctly and operates as intended.
- c. Verify that all new equipment test, training, and startup procedures have been completed per the specifications.
- d. Verify that all required new interfaces with for Life Safety the BAS have been installed correctly and operates as intended.
- e. Operate new equipment as intended to ensure the design conditions can be obtained.

3.9 CUTTING AND PATCHING:

- A. Cutting and patching associated with the work in the existing structure shall be performed a neat and workmanlike manner. Existing surfaces that are damaged by the contractor shall be repaired or provided with new materials to match existing.
- B. Structural members shall not be cut or penetrated. Holes cut through concrete and/or masonry to accommodate new work shall be cut by reciprocating or rotary, non-percussive methods.
- C. Patching of areas disturbed by installation of new work and/or required demolition shall match existing adjacent surfaces as to material, texture and color.

3.10 CLEAN – UP:

- A. Excessive debris and dirt, such as occurs from cutting through masonry or plaster walls shall be cleaned up from the equipment and removed immediately after the work of cutting through the walls.
- B. Debris shall be removed from UMB property.
- C. Ceiling panels shall be replaced as soon as work is finished in the area and shall be kept free of dirty fingerprints. Where work is being done in corridors used by patients and visitors, ceiling panels shall be replaced at the close of the day's work even if work is at the particular location is incomplete.
- D. All areas shall be left broom-clean at the end of the work period.

END OF DIVISION 260000

SECTION 270528.48 - MULTIMEDIA CONNECTION WALL BOX

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Multimedia Connection Wall Box

B. Related Sections include the following:

1. Division 27 Telecommunications Systems, Audiovisual Systems, wiring, connections, and installation of associated conduit infrastructure

1.2 PERFORMANCE REQUIREMENTS

- A. General: Wall boxes provide an interface between power and telecommunication cabling in a wall mount flat panel display locations requiring power and/or communication device outlets.
- B. Wall Mounted Connector Assembly: Rubber cable pass thru door and cover assembly along with connector mounting panel inserts
- C. Labeling: Wall boxes shall bear the “cULus mark” issued by UL for units complying with both US and Canadian Standards.
- D. Standards: Comply with the following:
1. National Electrical Code

1.3 SUBMITTALS

A. Related Sections

1. Comply with requirements of Section 01 33 00, “Submittal Procedures.”

B. Submittal Data

1. Submittal data is to be submitted as a complete, single digital file. All documents shall be clearly legible. Each submittal shall contain the below in the following order:
 - a. Cover Sheet

- 1) Include name of supplying contractor and project name.
- 2) Include submittal and revision number.

b. Detailed Bill of Materials

- 1) Include a listing of: component quantities, equipment manufacturers, model numbers, descriptions of each component being supplied, and the specification paragraphs or drawing sheets that correspond to each product.
- 2) The bill of materials shall be index referenced within the PDF file so that each product name is clickable, linked to the first page of the corresponding product data.
- 3) Failure to provide this information will result in the rejection of submittals.

c. Product Data

- 1) Include a catalog sheet per product of equipment listed in the Detailed Bill of Materials, in the exact order as the Detailed Bill of Materials. Each catalog sheet shall describe mechanical, electrical and functional equipment specifications. The catalog sheet must also include an image of the product.
- 2) Photocopy duplications of the manufacturer's original equipment catalog sheets will be allowed as long as they provide adequate clarity of both the printed word and graphics/pictures.
- 3) If more than one product is shown on the catalog sheet the intended product must be denoted by either an arrow or highlight. All optional components and selections shall be clearly indicated.

d. Authorized Distributor Certificate

- 1) Recently dated (within one year from submittal date) support letter from manufacturer stating that the supplying contractor is an Authorized Distributor of the product being supplied.

- e. Partial submittals, or submittals comprised of multiple PDF files, will not be accepted.

2. Informational Submittals:

- a. Manufacturer's installation instructions

C. Shop Drawings

1. Prior to fabrication submit contractor-generated drawings for approval for all supplied systems. These drawings shall include, but are not limited to, the following:
 - a. Title Sheet with sheet index and symbols legend

- b. All panels, plates, and designation strips, including connectivity, layout, labeling, and details relating to terminology, engraving, finish and color
 - c. All unusual equipment modifications
 - d. Equipment location drawings
 - e. Detailed riser drawing indicating conduit runs and associated (box knockout) cables within
 - f. Floor plans showing Wall box locations based on column grid lines
2. Drawings should be at project standard scale and clearly legible.
3. Resubmission of contract drawings does not constitute a complete shop drawings submittal and is unacceptable. Such submittals will be rejected.

D. Form

1. Submit all materials for review as described above, specifically referenced to the specification paragraph number (where applicable).
 - a. Submit all drawings on sheets of one size, preferably the project standard size.
 - b. On submittal drawings, maintain 3/32" minimum lettering height. Submittals with text less than 1/16" in height may be rejected.
2. Product Data and shop drawings must be submitted together in order to be reviewed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the specified requirements, provide products by one of the following available manufacturers. Manufacturers offering products that may be incorporated into the work include, and are limited to, the following:
 1. FSR
 2. Approved equal
- B. Model PWB-100 Wall Box:
 1. Box shall be:
 - a. Manufactured from 14-gauge steel approved for use in new and renovation construction locations.
 - b. Polyester based backed enamel finished interior (white).
 - c. Provided with two (2) independent wiring compartments.
 - d. Able to work with 1/2" or 5/8" dry wall.
 - e. Box to be able to be installed between 16" on center metal or wood studs.
 - f. Able to accept 2-3/4" x 4-1/2" standard size wall plates.

C. Overall box dimensions shall be as follows:

1. 11" W x 5.25" H x 3.57" D.

2.2 COVER

A. PWB-100-WHT - White Cover.

PART 3 - EXECUTION

3.1 EXAMINATION

A. With Installer present, verify that manufacturer's requirements for wall opening and infrastructure conditions have been satisfactorily met. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Verify exact locations of Wall box installation.

3.3 INSTALLATION

- A. Install equipment in compliance with approved shop drawings and manufacturer's installation instructions.
- B. Install in position and relationship to adjoining work indicated, securely anchored to supporting structure, sealed and finished, and in a manner, which produces a level box with square, plumb, and straight edges.
- C. Telecommunications Cabling Wall box shall have a total of three separate EC with pull string at each box as follows:
 1. One 3/4-inch EC from box to circuit panel. (Duplex AC Power)
 2. Two 1-1/4 inch EC from box to telecomm cable tray A.F.C. One conduit run to lower Low voltage backbox and one conduit run to the upper Low voltage backbox.
- D. Provide pull strings in each conduit at wall box location.

3.4 ADJUSTING

A. Adjust door and cover for proper operation.

3.5 PROTECTION

- A. Protect installed equipment in original undamaged condition until Substantial Completion. Remove and provide new components or units that cannot be repaired to the satisfaction of the Architect.

END OF SECTION 27 05 28.48

SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section and all other sections of Division 27.

1.2 SUMMARY

- A. Section Includes:

- 1. Pathways.
 - 2. UTP cabling.
 - 3. Cable connecting hardware, patch panels, and cross-connects.
 - 4. Telecommunications outlet/connectors.
 - 5. Cabling system identification products.
 - 6. Cable management system.

1.3 DEFINITIONS

- A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.
- B. BICSI: Building Industry Consulting Service International.
- C. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel.
- D. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
- E. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- F. EMI: Electromagnetic interference.
- G. IDC: Insulation displacement connector.
- H. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).
- I. LAN: Local area network.
- J. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

- K. RCDD: Registered Communications Distribution Designer.
- L. Solid-Bottom or Non-ventilated Cable Tray: A fabricated structure consisting of longitudinal side rails and a bottom without ventilation openings.
- M. Trough or Ventilated Cable Tray: A fabricated structure consisting of longitudinal side rails and a bottom having openings for the passage of air.
- N. UTP: Unshielded twisted pair.

1.4 HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.
 - 1. ANSI/TIA-568-C requires that a minimum of two (2) telecommunications outlet/connectors be installed for each work area.
 - 2. Transition points or consolidation points are not allowed between the horizontal cross-connect and the telecommunications outlet/connector.
 - 3. Bridged taps and splices shall not be installed in the horizontal cabling.
 - 4. Splitters shall not be installed as part of the optical fiber cabling.
- B. A work area is approximately one hundred (100) sq. ft. and includes the components that extend from the telecommunications outlet/connectors to the station equipment.
- C. The maximum allowable horizontal cable length is two hundred ninety five (295) feet. This maximum allowable length does not include an allowance for patch cords at the workstation, and patch cords at the equipment room. System designer should plan for a combined cable length (horizontal cable length plus patch cord length) not to exceed three hundred twenty eight (328) feet.

1.5 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in ANSI/TIA-568-C, when tested according to test procedures of this standard.

1.6 SUBMITTALS

- A. Product Data: For each type of product specified in this section.
- B. Shop Drawings:
 - 1. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
 - 2. Cabling administration drawings and printouts.
 - 3. Wiring diagrams to show typical wiring schematics, including the following:

- a. Cross-connects.
 - b. Patch panels.
 - c. Patch cords.
 4. Cross-connects and patch panels. Detail mounting assemblies and show elevations and physical relationship between the installed components.
 5. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
 - a. Vertical and horizontal offsets and transitions.
 - b. Clearances for access above and to side of cable trays.
 - c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
 - d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.
 6. Provide layout drawings coordinated with receptacle locations shown.
 7. Provide test reports with corrective measures documented.
 - C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector, and RCDD
 - D. Source quality-control reports.
 - E. Field quality-control reports.
 - F. Maintenance Data: For splices and connectors to include in maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff. RCDD, testers, and installers shall be certified by the manufacturer of the product being installed.
 1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
 2. Installation Supervision: Installation shall be under the direct supervision of RCDD, who shall be available at all times when Work of this Section is performed at Project site. A Level 2 Installer must be present at all times when Work of this Section is performed at Project site.
 3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
 - B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Twenty five (25) or less.
 2. Smoke-Developed Index: Four hundred fifty (450) or less.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Telecommunications Pathways and Spaces: Comply with latest version of TIA-569.
- E. Grounding: Comply with J-STD-607-A-2002 and all applicable sections of NFPA 70, NEC.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
1. Test optical fiber cables while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; including the loss value of each. Retain test data and include the record in maintenance data.
 2. Test each pair of UTP cable for open and short circuits.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Drywall, sanding, and all painting of all surfaces shall be completed before installing cable in equipment rooms.

1.10 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with UMB's telecommunications and LAN equipment and service suppliers.
- B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area, unless otherwise noted on telecommunications drawings to meet ADA requirements.

1.11 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Patch-Panel Units: One (1) of each type.
 2. Connecting Blocks: One (1) of each type.

1.12 WARRANTY/GUARANTEE

- A. See Division 26 Specification Section “Basic Electrical Requirements’ for warranty and guarantee requirements.

PART 2 - PRODUCTS

2.1 PATHWAYS

- A. General Requirements: Comply with ANSI/EIA/TIA-569-B.
- B. Support of Open Cabling: NRTL labeled for support of Category 6a cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 1. Velcro straps.
 - 2. J-hooks.
- C. Cable Trays:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Cable Management Solutions, Inc.
 - b. Chatsworth Products Inc.
 - c. Cablofil Inc.
 - d. Cooper B-Line, Inc.
 - e. Cope - Tyco/Allied Tube & Conduit.
 - 2. Cable Tray Materials: Metal, suitable for indoors and protected against corrosion by hot-dip galvanizing, complying with ASTM A 123/A 123M, Grade 0.55, not less than 0.002165 inch thick steel, steel wire mesh or aluminum.
- D. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."
 - 1. Outlet boxes shall be no smaller than two (2) inches wide, four (4) inches high and two and one half (2-1/2) inches deep.

2.2 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Berk-Tek; a Nexans company.
 - 2. CommScope, Inc.
 - 3. Mohawk; a division of Belden CDT.
 - 4. Superior Essex Inc.
 - 5. General Cable Company.

6. Siemon

- B. Description: 16-20 AWG, solid copper conductors, 100-ohm, 4-pair UTP, nominal impedance +/- 15%, green CMP Plenum jacket and complies with EIA/TIA 568-C Category 6a standard.

1. Comply with ICEA S-116-732 for mechanical properties.
2. Comply with ANSI/TIA-568-C.2, Category 6A
3. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

- a. Communications, Plenum Rated: Type CMP, complying with NFPA 262.

2.3 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
1. Siemon Co.
 2. Ortronics Corp.
- B. General Requirements for Cable Connecting Hardware: Comply with ANSI/TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of the same manufacturer and of same category or higher.
- C. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
- D. Number of Jacks per Field: One (1) for each two-pair conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criteria.
- E. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
- F. Patch Cords: Factory-made, four-pair cables in [thirty six (36) inch] [eighty four (84) inch] lengths <Insert length>; terminated with eight-position modular plug at each end.
1. Patch cords shall have bend-relief-compliant boots to ensure Category 6a performance. Patch cords shall have latch guards to protect against snagging.

2.4 TELECOMMUNICATIONS OUTLET/CONNECTORS

- A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with ANSI/TIA-568-C.2 Category 6a.
- B. Workstation Outlets: Four-port-connector assemblies mounted in single faceplate.

1. Metal Faceplate: Stainless steel, complying with requirements in Division 26 Section "Wiring Devices."
2. For use with snap-in jacks accommodating any combination of UTP, LC optical fiber, and work area patch cords.
 - a. Flush mounting jacks, positioning the cord (downward) at a 45-degree angle.
 - b. Flush mounting jacks, positioning the cord at a 90-degree angle for wall phones only.
3. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.5 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Comply with requirements of NFPA 70, NEC, National Electrical Code.

2.6 IDENTIFICATION PRODUCTS

- A. Comply with ANSI/TIA/EIA-606-B and ANSI/UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

2.7 SOURCE QUALITY CONTROL

- A. Factory test UTP and optical fiber cables on reels according to ANSI/TIA-568-C.2.
- B. Factory test UTP cables according to ANSI/TIA-568-C.2.
- C. Factory test multimode and single mode optical fiber cables according to and ANSI/TIA-568-C.2.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports, including all deficiencies and corrective measures.

PART 3 - EXECUTION

3.1 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."

- B. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools to comply with manufacturer's recommendations.

3.2 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and ANSI/TIA/EIA-569-B.
- B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.
- C. Comply with ANSI/TIA/EIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- D. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- E. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- F. Pathway Installation in Communications Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
 - 2. Install vertical and horizontal cable trays to route cables if conduits cannot be located in these positions.
 - 3. Secure conduits to backboard when entering room from overhead.
 - 4. Extend conduits three (3) inches above finished floor.
 - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- G. Backboards: Install backboards with ninety six (96) inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.3 INSTALLATION OF CABLES

- A. Comply with NECA 1-2010, The Standard Practice of Good Workmanship in Electrical Construction, and BICSI TDMM.
- B. General Requirements for Cabling:
 - 1. Comply with ANSI/TIA-568-C.2.
 - 2. Comply with BICSI ITSIMM, Ch 5 "Cable Installation"
 - 3. Install 110-style IDC termination hardware unless otherwise indicated. Terminate conductors; no cable shall contain un-terminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 4. Cables may not be spliced.

5. Secure and support cables at intervals not exceeding thirty (30) inches and not more than six (6) inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cable Installation" Chapter. Install distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Do not allow un-terminated cable to lay on floor, prior to installation. Remove and discard cable if damaged prior to and/or during installation and replace it in its entirety with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating. In the communications equipment room, install a ten (10) foot long service loop in the cable tray, on the backboard or on each end of cable.
9. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Cable Installation." Monitor cable pull tensions and ensure manufacturer's specified tension limits are not exceeded.

C. UTP Cable Installation:

1. Comply with ANSI/TIA-568-C.2.
2. Do not untwist UTP cables more than one half (1/2) inch from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of eight (8) inches above ceilings by cable supports not more than forty eight (48) inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, equipment, or other potentially damaging items.

E. Conduit Installation:

1. Install conduit bushings at each end of conduit to avoid disturbing cable jacket. Provide pull string in spare conduits and label at both ends.

F. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable six (6) feet long not less than twelve (12) inches in diameter below each feed point.

G. Group connecting hardware for cables into separate logical fields.

H. Separation from EMI Sources:

1. Comply with BICSI TDMM and ANSI/TIA/EIA-569-B for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of five (5) inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of twelve (12) inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of thirty six (36) inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of two and one half (2-1/2) inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of six (6) inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of eighteen (18) inches.
4. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
5. Separation between Communications Cables and Fluorescent Fixtures: A minimum of twelve (12) inches.

3.4 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping."
- B. Comply with ANSI/TIA/EIA-569-B, "Firestops."
- C. Comply with BICSI TDMM, "Firestop Systems" Chapter.

3.5 GROUNDING

- A. Install grounding according to BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
- B. Comply with J-STD-607-A-2002.
- C. Comply with NFPA 70-NEC.
- D. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least two (2) inch clearance behind the grounding bus bar. Connect grounding

bus bar with a minimum No. 4 AWG green THHN/THWN insulated grounding electrode conductor from grounding bus bar to suitable electrical building ground.

- E. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG green THHN/THWN insulated equipment grounding conductor.

3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with ANSI/TIA-606-B. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

- 1. Administration Class: 3.

- B. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards.

- C. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of ANSI/TIA-606-B. Furnish electronic record of all drawings, in software and format selected by Owner.

- E. Cable and Wire Identification:

- 1. Label each cable within two (2) inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is required to be numbered at device and numbered within panel or cabinet.
 - 3. Label each terminal strip and screw terminal in each outlet jack, cabinet, rack, and panel.
 - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown. Identify with one label.
 - b. Label each unit and field within distribution racks and frames.
 - c. Each outlet shall have an identification code consisting of five (5) digits (six (6) if "LL" is used instead of "B"). The first digit shall indicate the floor of the building where the outlet is located. The letter "G" shall be used for the ground floor. One (1) for the first floor, etc. The letter "B" shall be used

- for basements, "S" for subbasement, "LL" for lower level, and "M" for mezzanine.
- d. The second digit shall be the closet identifier. The letter "N" shall be used to indicate the north closet, the letter "S" shall be used to indicate the south closet, the letter "E" shall be used to indicate the east closet, and the letter "W" shall be used to indicate the west closet. If there is only one closet per floor, we use the letter "N."
- e. The last three digits shall denote the number of the outlet. Outlet numbers one (1) through nine (9) shall be preceded with two zeros (e.g. 1N008). Outlet number ten (10) through ninety nine (99) shall be preceded with one zero (e.g. 1N028).
- f. In the Telecommunications Room, data patch panels will be labeled with both the outlet # and the jack #. For instance for outlet # 1N028, the patch panel will read 1N028-D1, and 1N028-D2.
- g. The color code for Communication Outlet Icons is as follows:
 - 1) Category 6a data jack "GREEN"
- 4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware.
- F. Labels shall be preprinted or computer-printed type with white printing area and black font color that complies with requirements in ANSI/TIA-606-B.
 - 1. Labels on cables shall be flexible vinyl or polyester that flex as cables are bent.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with ANSI/TIA-568-C.2.
 - 2. Visually confirm Category 6A marking of outlets, cover plates, outlet/connectors, and patch panels.
 - 3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 4. Test UTP horizontal copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination and before cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in ANSI/TIA-568-C.2. Perform tests with a tester that complies with

performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

5. Optical Fiber Cable Tests:

- a. Test instruments shall meet or exceed applicable requirements in ANSI/TIA-568-C. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- b. Link End-to-End Attenuation Tests:
 - 1) Horizontal and multimode horizontal link measurements: Test at 850 or 1300 nm in one (1) direction according to TIA/EIA-526-14-A, Method B, One (1) Reference Jumper.
 - 2) Attenuation test results for horizontal links shall be less than 1.0 dB. Attenuation test results shall be less than that calculated according to equation in ANSI/TIA-568-C.

6. UTP Performance Tests:

- a. Test for each outlet. Perform the following tests according to ANSI/TIA-568-C:
 - 1) Wire map.
 - 2) Length (physical vs. electrical, and length requirements).
 - 3) Insertion loss.
 - 4) Near-end crosstalk (NEXT) loss.
 - 5) Power sum near-end crosstalk (PSNEXT) loss.
 - 6) Equal-level far-end crosstalk (ELFEXT).
 - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
 - 8) Return loss.
 - 9) Propagation delay.
 - 10) Delay skew.

7. Optical Fiber Cable Performance Tests: Perform optical fiber end-to-end link tests according to ANSI/TIA-568-C.

8. Final Verification Tests: Perform verification tests for UTP and optical fiber systems after the complete communications cabling and workstation outlet/connectors are installed.

- a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.

- C. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- D. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports noting all deficiencies and corrective measures

END OF SECTION 271500

DIVISION 280000 – FIRE ALARM, SAFETY AND SECURITY

PART 1 – GENERAL REQUIREMENTS

1.1 RELATED DOCUMENTS

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

1.2 SCOPE:

- A. The electrical contractor shall furnish all labor, material, tools, equipment and services necessary and incidental for installing all Fire Alarm system(s) shown on the drawings, indicated in the specifications, or necessary to provide a finished installation. The finished installation shall be in perfect working condition and be ready for continuous and satisfactory operation. The project area as indicated on drawings (6th Floor). The project area is located in the School of Nursing, Floor 6.
- B. This section includes Fire Alarm devices to be connected to fire alarm system.

1.3 CODES & REGULATIONS

- A. All materials furnished and all work installed shall comply with the latest rules, regulations, and recommendations of the following bodies:
 - 1. International Building Code
 - 2. National Electric Code
 - 3. National Fire Protection Association
 - 4. Fire Protection Bureau State of Maryland
 - 5. Underwriters Laboratories

1.4 RESPONSIBILITY

- A. The construction manager/general contractor (CM/GC) shall be responsible for all work included in Division 28. The delegation of work to contractors shall not relieve him of this responsibility. Contractors who perform work under these sections shall be responsible to the CM/GC.

1.5 SITE EXAMINATION

- A. Failure to visit the site and become familiar with existing project conditions prior to bidding will not relieve the Contractor of responsibility for complying with the Contract Documents.

1.6 OUTAGES

- A. For all work requiring an outage, the electrical contractor shall submit an outage request to the UMB Project Manager, using the UMB Standard Request for Outage Form which is available through the UMB Design and Construction Web Site at <https://www.umaryland.edu/designandconstruction/design-and-construction-documents/umb-standard-project-forms---current-editions/>
- B. The existing systems shall remain operational unless turned off by University personnel during the construction of the project. For each outage request include a photograph or description of the area affected by the outage.
- C. Unless otherwise specified, outages of any services required for the performance of this contract and affecting areas other than the immediate work area shall be scheduled at least ten business days (10) days in advance with the UMB Design and Construction Department. Outages shall be performed during normal duty hours. If necessary some outage work may be performed outside normal hours if approved by UMB.
- D. The electrical contractor shall include in his price the cost of all premium time required for outages and other work which interferes with the normal use of the building, which will be performed, in most cases, during other than normal work time and at the convenience of the UMB Design and Construction Department.
- E. The operation of electrical/fire alarm/safety/security panels or power switches; required to achieve an outage must be accomplished by University personnel only. Unauthorized operation of fire alarm, by contractors their personnel will result in extremely serious consequences for which the contractor will be held accountable.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions:
 - 1. Notify UMB Project Manager no fewer than ten (10) days in advance of proposed interruption of fire-alarm service.
 - 2. Do not proceed with fire-alarm outage without UMB Project Manager's written permission.
 - 3. Where a required existing fire protection system is out of service or during system Outage, the contractor shall provide fire watch as required by the UMB Fire Marshal until the existing system is restored.
<http://www.umaryland.edu/media/umb/af/ehs/firesafety/FireWatchProcedures.pdf>

1.8 SUBMITTALS

A. General Requirements: For general requirements see Architectural Specification Division 01 Section "Submittal Procedures" and the following:

1. After contract award and before material is ordered submit electrically all product data, shop drawings, drawings and other such descriptive data as the Engineer may require to demonstrate compliance with the contract documents as required by the contract clauses for review and approval.
2. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable publication references, years of satisfactory service, and other information necessary to establish contract compliance of each item the Contractor proposes to furnish.
3. All equipment shall be approved and listed by Underwriters' Laboratories (UL) and shall bear nameplate indicating same.
4. Submittals will be reviewed for general compliance with design concept in accordance with contract documents, but dimensions, quantities, or other details will not be verified.
5. Submittals shall include the following items:
 - a. Article 2.2, Fire Stops, Smoke Seals and Rated Wall/Floor Penetrations
 - b. Article 2.8, Raceway
 - c. Article 2.9, Boxes and Enclosures
 - d. Article 2.10, Wire and Cable
 - e. Article 2.11, General Wire and Cable Requirements
 - f. Article 2.12, Identification
 - g. Article 2.13, O & M Manual Do not include this data in the Fire Alarm Submittal.
 - h. Warranties and maintenance instructions shall be included in the O & M Manual only. Do not include this data in the Fire Alarm Submittal.
6. Submittal File Format: File formats and names for each submittal shall be electronically as follows:
 - a. File Formats:
 - 1) Product Data: "pdf" file format.
 - 2) Design Shop Drawings: "pdf" and "dwg" file formats.
 - 3) Coordinated Drawings: "pdf" or "dwg" file formats.
 - 4) Schedules: "xl" file format.

- B. Fire Alarm Submittal: In addition to the requirements identified in paragraph 1.8.A the fire alarm contractor shall also comply with the following:
1. UMB requires the Fire Alarm Submittal to be submitted electronically as one (1) complete submission as a “pdf” file for review. Partial Submittals will be rejected.
 - a. The complete submittal must be reviewed and approved by the A/E and the UMB Fire Marshal before installation can take place. The submission shall include the following:
 - 1) Product data for each type of product specified.
 - 2) Shop drawings (See Paragraph ‘2’ below for requirements)
 - 3) Voltage drop calculations
 - 4) Installers qualifications
 - b. The warranty information and maintenance manuals shall be included in the Division 28 Project O & M Manual. Do not include this data in the Fire Alarm Submittal.
 2. Shop Drawings shall be prepared by persons trained and certified by the manufacturer in fire-alarm system design. Shop drawings shall be signed or stamped by an individual with one of the following qualifications:
 - a. NICET fire-alarm technician, Level IV minimum.
 - b. Professional Engineer registered in the State of Maryland.
 - c. The qualified individual signing the shop drawings must attend any and all review comment resolution meetings requested by the University.
 3. Submittal drawings must include the following:
 - a. Provide floor plans with all device locations and their associated addresses. Floor plans must be drawn to scale. Provide graphic scales on the drawings.
 - 1) For new building construction projects or replacement of existing building entire fire alarm system projects, use NFPA 170 symbols.
 - 2) For renovation projects match the symbols used on As-Builts.
 - 3) Provide a riser diagram regardless of system size.
 - 4) Wiring Diagrams: Provide the following:
 - a) Detail wiring and differentiate between manufacturer-installed and field-installed wiring.
 - b) Include diagrams for equipment and for system with all terminals and interconnections identified.
 - c) Include all internal network cards and boards in FACP and Transponder Panels.
 - b. Calculations shall include the following:

- 1) Battery: Sizing calculations.
 - 2) Load Calculations - Provide load calculations for all NAC circuits while noting both current demand future capacity in amperes.
 - c. System Sequence of Operation: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
 - d. Details of graphic and alphanumeric annunciators.
4. Renovation Projects: For projects involving only modifications to the existing FAS, the University will provide electronic copies to the FAS manufacturer of their latest version of the FAS As-Builts. The FAS manufacturer will make all necessary revisions to the FAS as-builts and submit them for review/approval. Once the project is completed, the FAS manufacturer will update the copies for forwarding electronically to the University for archiving. In revising the electronic copies of the University's as-builts, please perform the changes in the following format:
 - a. CAD Dwg Format: Show all new wiring and equipment in BOLD so it is convenient to differentiate between new and existing.
5. Submissions to UMB Fire Marshal:
 - a. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Resubmit if required to make clarifications or revisions to obtain approval.
- C. Safety System (SAF) Submittals: In addition to the requirements identified in paragraph 1.8.A the safety system contractor shall also comply with the following:
 1. UMB requires the Safety System Submittal to be submitted electronically as one (1) complete submission as a "pdf" file for review. Partial Submittals will be rejected.
 - a. The complete submittal must be reviewed and approved by the A/E and UMB before installation can take place. The submission shall include the following:
 - 1) Product data for each type of product specified.
 - 2) Shop drawings (See Paragraph '2' below for requirements)
 - 3) Installers qualifications

- b. The warranty information and maintenance manuals shall be included in the Division 28 Project O & M Manual. Do not include this data in the Safety System Submittal.
- 2. Shop Drawings shall be prepared by persons trained and certified by the manufacturer in safety system design.
- 3. Submittal drawings must include the following:
 - a. Provide floor plans with all device locations and their associated addresses. Floor plans must be drawn to scale. Provide graphic scales on the drawings.
 - 1) Provide a riser diagram regardless of system size.
 - 2) Wiring Diagrams: Provide the following:
 - a) Detail wiring and differentiate between manufacturer-installed and field-installed wiring.
 - b) Include diagrams for equipment and for system with all terminals and interconnections identified.
 - c) Include all internal network cards and boards in the Safety Control Panel.
 - b. Calculations shall include the following:
 - 1) Battery: Sizing calculations.
 - c. Device Address List shall include the following:
 - 1) Coordinate with final system programming.
 - 2) Floor plans shall include address numbers for all devices.
- D. Informational Submittals: Submit following:
 - 1. Operating Instructions: For mounting at FACP.
 - 2. Product Certificates: Signed by manufacturers of system components certifying that products furnished comply with requirements.
 - 3. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.
 - 4. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Comply with NFPA 72.
- E. Project Closeout Submittals: Submit the following in accordance with the UMB General Conditions.
 - 1. Electronic Copies of Each System Program: Provide a minimum of two (2) electronic copies of the system program on USB Flash Drive. Store one (1) USB Flash Drive copy of the program at the FACP and hand the other copy over to the Project Manager. Besides being required by NFPA 72, the purpose for this

requirement is to ensure the owner always has on hand a “bug free” copy of the original.

2. Manufacturer’s As-Built Drawings: Upon successful testing and commissioning of the FAS and approval by the University’s Fire Marshal, the FAS manufacturer shall provide the following:
 - a. As-Built Drawings: The Manufacturer shall revise/update the Shop Drawings to accurately reflect the following field installation data/conditions:
 - 1) All individual device addresses on the floor plans.
 - 2) Conduit/SLC & NAC Loop Wiring Layout - Show routing of all FAS wiring and raceway including riser runs and while noting all FAS device and panel locations. Identify all panels with their respective ID numbers/lettering as entered in the FAS programming software. Where multiple FAS circuits are run in parallel and/or grouped together, attach drawing notes to the runs to identify the individual FAS circuits in the grouped or parallel run. Delineate overhead versus underground runs by using dashed lines for underground.
 - 3) Riser and/or connection diagram.
 - 4) Equipment Data - Provide Manufacturer’s catalog information on all internal network cards/option modules in the system.
 - 5) Provide both paper copies and electronic files in AutoCAD 2018 or latest edition used by UMB in “dwg” and “PDF” file formats. Provide two (2) full-size paper copies (24 inches x 36 inches) and three (3) half-size copies for UMB review personnel only. Provide graphic scales on the drawings.
 - b. Updated copies of load calculations, System Program and Sequence of Operation as submitted during in the shop drawing phase.
 - c. Maintenance Data: For fire alarm systems. Comply with NFPA 72.
 - d. Certificate of Completion: Comply with NFPA 72.

1.9 WORK PERFORMANCE

- A. All electrical work must comply with the requirements of NFPA 70 (NEC), NFPA 70B, NFPA 70E, OSHA Part 1910 subpart J, OSHA Part 1910 subpart S and OSHA Part 1910 subpart K in addition to other references required by the contract.
- B. Before initiating any work, a job specific work plan must be developed by the contractor. The work plan must include procedures to be used on and near the live electrical equipment, barriers to be installed, and safety equipment to be used and exit pathways.
- C. Job site and worker safety are the responsibility of the contractor. Compliance with the

requirements of NFPA 70E is subject to ongoing inspection by University personnel and failure to comply will result in an immediate Stop Work order being issued and enforced at the contractor's expense.

- D. Energized electrical conductors and circuit parts to which an employee might be exposed shall be put into an electrically safe work condition before an employee performs work any time the employee is within the limited approach boundary or, where an increased risk of injury from an exposure to an arc flash hazard exists.
- E. Outages should be scheduled a minimum of ten (10) days in advance.
- F. Mandatory Requirements: The following requirements are mandatory:
 - 1. Protective Equipment: Electricians must use full protective equipment (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools, etc.) while working on energized systems in accordance with NFPA 70E.
 - 2. UMB Energized Work Permit: A UMB Energized Work Permit is required for any work on energized circuits or equipment. Permit must be approved by UMB Department of Operations and Maintenance prior to performing energized work. Submit the work permit with the outage request.

1.10 QUALITY ASSURANCE

A. Installer's Qualifications:

- 1. The Contractor or security sub-contractor shall be a licensed security Contractor with a minimum of five (5) years' experience installing and servicing systems of similar scope and complexity. The Contractor shall be an authorized regional representative of the Electronics Safety and Security manufacturers.
- 2. The Contractor shall only utilize factory-trained technicians to install, program, and service the Electronic Safety and Security systems. The technicians shall have a minimum of five (5) continuous years of technical experience in electronic security systems. Upon request the Contractor shall provide copies of system manufacturer certification for all technicians.
- 3. Copy of Maryland Master Electrician's License.
- 4. Local of State license where required.
- 5. NICET certification, where required by these specifications.

6. The Fire Alarm contractor shall have (or contractually be supported by a company who has) on staff and assigned to the project a NICET Level III certified person for fire alarm systems.
7. A NICET Level II or higher Fire Alarm Technician or a Fire Alarm Technician with minimum of two (2) years' experience shall install and terminate fire alarm devices, cabinets and panels. The Fire Alarm technicians installing the equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings
8. An electrician or NICET Level II Fire Alarm Technician shall install conduit for the fire alarm system.

1.11 SYSTEM DESCRIPTION

- A. Fire Alarm System Non-coded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.
- B. Fire Alarm System Non-coded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

1.12 IDENTIFICATION BADGES

- A. Contractors must obtain photo identification cards for all employees who will be at the construction site. The University will charge the contractor twenty five (\$25.00) dollars for each badge as a deposit of which twenty (\$20.00) dollars will be returned when the badge is returned. Lost photo I.D. card will cost twenty five (\$25.00) dollars for another replacement card. (The above charges are subject to change without notice.)

1.13 HAZARDOUS MATERIALS

- A. Identification and removal of hazardous materials (asbestos, lead paint, PCBs) is not part of this contract. If questionable material is encountered, notify the University Project Manager and the University Environmental Health and Safety in writing immediately. The University shall then arrange for investigation and possible abatement of the material. Contractor shall schedule his work to accommodate hazardous material removal by the Owner.

1.14 COMMISSIONING NEW FIRE ALARM, SAFETY AND SECURITY SYSTEMS

- A. Summary: This section includes the requirements for commissioning electrical systems, assemblies and equipment related to the project area.

B. Commissioning Agent (CxA): The CxA for the project shall be as assigned by UMB.

1. Description: The following equipment and/or accessories shall be commissioned as part of this project: Fire Alarm System.

1.15 GUARANTEE/WARRANTEE:

- A. All materials, equipment, etc. provided by the general contractor and/or his subcontractors shall be guaranteed and warranted to be free from defects in workmanship and materials for a period of two (2) years from the date of substantial completion and acceptance of work by UMB. Any defects in workmanship, materials, or performance which appear within the guarantee period shall be corrected by the contractor without cost to the owner, within a reasonable time, to be specified by UMB. In default thereof, owner may have such work done and charge the cost of same to the contractor. In addition to the above statement the Guarantee/Warranty Period shall include all labor cost related to all warranty work.
- B. The above shall not in any way void or abrogate equipment manufacturer's guarantee or warranty. Certificates of guarantee shall be delivered to the Owner.

PART 2 – PRODUCTS:

2.1 LISTED MANUFACTURERS

- A. The manufacturers indicated in Part 2 represent the design and identify the minimum level of quality for materials and equipment, specified in this section, that are acceptable to UMB. All submitted materials and equipment are subject to approval by the A/E and UMB.
- A. New Construction: All new penetrations shall be provided with a pipe sleeve and sealant materials.
- B. Existing Construction: All new service penetrations through existing rated assemblies shall be provided with a pipe sleeve and sealant materials. All existing unsealed penetrations for services passing through existing rated assemblies within the project area shall be provided with sealant materials.
- C. Project Area: The project area shall include the finished spaces and related sections of the utility shafts within the project area footprint.
- D. Wall Pipe Sleeve Applications: Pipe sleeves shall be required for all new conduit penetrations through rated wall assemblies and non-rated CMU walls. Where pipe sleeves are installed in non-rated CMU walls fire rated sealant materials are not required. Provide acoustical caulking to seal the annular spaces between the sleeve and the bare pipe or pipe insulation on each end with one half (1/2) inch caulking all around the annular space.

- E. Floor Pipe Sleeves Applications: Pipe sleeves are required for all new conduit risers passing through floor slabs.

2.2 SLEEVES

- A. Steel Pipe Sleeves: Steel pipe sleeves shall be standard black steel pipe Type E, Grade B, with plain ends conforming to ASTM A53/A53M.

2.3 FIRE ALARM SYSTEM

A. General Requirements:

1. UMB does not have a service contract with any other company to work on the existing fire alarm system. Any certified Notifier Fire Alarm System distributor can work on the existing system. Upon request the contractor shall provide proof of their Notifier Engineered System Distributor Agreement to the University.
2. The existing UMB Campus Notifier Network System is under warranty with MC Dean. Any required work with the Network System must be coordinated with the UMB Project Manager.

B. Existing Fire Alarm System NOTIFIER:

1. Fire Alarm Control Panel Model NFS2-3030 with display.
2. Digital Voice Command (DVC), Voice Evacuation Control System.

- C. System Expansion: Confirm existing Signaling Line Circuit (SLC) and Notification Appliance Circuit(s) (NAC) will support the additional fire alarm devices shown on the contract drawings. Provide additional circuits and/or amplifier boards where necessary.

- D. Prior to programming of the new/existing FACP, the contractor shall verify in field exact room numbers and names for all initiating devices, elevator numbers and stair numbers to program the correct device address.

- E. Speaker/strobes shall be semi-flush mounted with red covers and clear strobe lens. Ceiling mounted devices are acceptable.

- F. Speaker/strobes signals shall comply with the requirements of the ADA. Ceiling mounted devices are acceptable.

- G. Strobe units shall consist of a red cover and clear lens. Strobe signals shall comply with the requirements of the ADA.

- H. Strobes shall be provided with a candela rating as indicated.

2.4 RACEWAY

- A. For indoors above floor slab, use EMT conduit with compression fittings with a minimum size of three quarter (3/4) inch (regardless of function/purpose) and maximum size of two (2) inches. Above two (2) inches, conduit shall be rigid steel conduit, zinc coated with threaded type fittings.
 - 1. For low-voltage, special systems provide the following color-coated EMT raceway:
 - a. Fire Alarm System – Red.
- B. Non-Metallic Raceway: Provide expansion joints in every twenty (20) foot of run and at least once in every run in all outdoor, rooftop, and garage locations. Provide PVC 40 pipe, non-metallic NEMA 4X boxes and non-metallic NEMA 4X enclosures supported via non-metallic fiberglass strut and/or pipe clamps at the following locations:
 - 1. All outdoor locations including, but not limited to, inside garages and on rooftops.
 - 2. Embedded in concrete, brick, CMU or other structural material.
 - 3. Below-slab and -grade.
 - 4. All unconditioned-air spaces/rooms in Parking Garages.
- C. Supports: For all indoor, conditioned-space locations utilize conduit clamps, conduit straps, bean clamps, etc. and/or channel strut supports. For all outdoor applications (as specified above for PVC 40) and where non-metallic raceway is provided, provide only non-metallic fiberglass (or other non-metallic material) or PVC-Coated Galvanized Steel conduit supports and/or channel strut. Support conduits at a minimum of two (2) times per ten (10) ft. length and at a frequency rate as directed by the NEC.
- D. Bushings: Provide only threaded type for IMC, RGS and PVC-RGS raceway. Provide only steel compression type for all EMT raceway systems. Provide insulated-throat, threaded type bushings for all tel/data raceway systems.
- E. Surface metal raceways shall be used only in finished areas and only where specifically noted on the drawings. Surface mounted raceways shall be Wiremold 500, 700, 1000, or 4000 series or pre-approved equivalent with buff finish used as follows:
 - 1. # 500: 2-#10 or 3-#12 wires maximum.
 - 2. # 700: 3-#10 or 4-#12 wires maximum.
 - 3. #1000: 9-#10 or 12-#12 wires maximum.
 - 4. Other combinations of conductors shall be in accordance with the manufacturer's published data and the National Electrical Code.
 - 5. All elbows, boxes fittings supports, etc., shall be by the raceways manufacturer. Finish shall match that of the raceway.
 - 6. Wire trough shall be steel enclosed wireway meeting all UL requirements.

- F. All new raceways in finished areas shall be concealed unless specifically noted otherwise.
- G. Grout around all conduits at ceiling, floor, and wall penetrations to provide airtight seal. All floor slab and fire-rated wall penetrations shall be sealed with a rated system/installation that is pre-approved by the UMB Fire Marshal. Submit manufacturer's engineering drawing of the proposed fire-proofing system to the UMB Project Manager for approval.
- H. Group together exposed conduit insofar as possible. Install all conduits parallel or perpendicular to the building surfaces. Maintain minimum six (6) inch spacing from parallel flues, steam pipes, or hot water pipes and two (2) inches from perpendicular flues, steam or hot water pipes.
- I. All conduits shall be rigidly supported to building structure. Conduits shall not be supported from suspended ceiling support wires.
- J. All conduit bends shall be made with an approved conduit bender and no bend shall have a centerline radius less than six times the diameter of the conduit.
- K. Core Drilling/Floor Penetrations: Coordinate with the UMB Project Manager prior to making any core drills for floor penetrations. Prior to core drilling/floor penetrations provide X-ray examination/GPD of the floor structure to locate structural steel for avoidance. The contractor is responsible for maintaining structural integrity of all floors and walls after core drills for conduits are made.

2.5 BOXES AND ENCLOSURES

- A. Indoor Applications: Provide NEMA 250 interior galvanized steel, minimum 14 gauge, outlet boxes, no less than four (4) inches square with extension rings and mounting brackets at the following locations:
 - 1. Dry and Clean Locations: NEMA Type 1.
 - 2. Locations with Dust, Falling Dirt and Dripping Noncorrosive Liquids: NEMA Type 12.
 - 3. Mechanical and Electrical Rooms: NEMA Type 12.
- B. Outlet boxes shall be rigidly and securely fastened in place. Outlet boxes in finished areas shall be flush mounted unless otherwise noted.
- C. Boxes shall be sized in accordance with NEC Article 370.
- D. All conduit connectors and entry hubs shall be insulated or have insulated bushings.

- E. Outlets shown adjacent to one another on the plans at the same mounting height shall be ganged except where noted.
- F. Outlets shown adjacent to one another on the plans at different mounting heights shall be located with the upper outlet centered directly over the lower outlet.
- G. GEM Boxes – Recessed GEM Boxes are prohibited.

2.6 WIRE AND CABLE

- A. All wire shall be copper with insulation rated at 600 volts, 75°C minimum. Aluminum wire is strictly prohibited.
- B. Minimum wire sizes shall be #12 for power wiring, #14 for control wiring and as specially noted for systems wiring.
- C. Molded connectors (wire nuts) may be used for splicing size 10 AWG or smaller wires on lighting and receptacle circuits only. “Scotch Blocks” must be submitted for prior approval. All other wiring shall be spliced only with lugs and/or terminal blocks.
- D. Terminal lugs shall be mechanical clamp or compression type.
- E. Pre-insulated crimp connectors and terminals shall be used on low voltage wiring.
- F. UTP Cable:
 - 1. Four (4) pair unshielded twisted pair (22-24AWG), solid copper conductors, 100 ohms nominal impedance +/- 15%, minimum bandwidth 500 MHz, green CMP Plenum jacket. Complies with EIA/TIA 568 Category 6 performance specifications.
 - 2. Manufacturer: CommScope, BerkTek (LAN Mark-1000), General Cable, Superior Essex
- G. UTP Cable Hardware:
 - 1. Eight (8) pin modular outlet, non-keyed, flat front. Complies with EIA/TIA 568-B.2 Category 6 performance. Outlet wired standards compliant 568B pinning. Outlets must be white.
 - 2. Manufacturer: The Siemon Company, Ortronics

2.7 GENERAL WIRE AND CABLE REQUIREMENTS

- A. Fire Alarm System:

B. Fire Alarm Control Cable Type MC

1. For use on fire alarm circuits as required and as recommended by the manufacturer.
2. Interlocking galvanized steel armor, steel strip (painted red).
3. Conductor insulation – TFN/THHN solid copper.
4. Copper grounding conductor.
5. Polyester assembly tape.
6. Neutral conductor.
7. UL Listed Fire Alarm Cable.
8. Rated for use in plenums.
9. Rated for through penetration of 1, 2, and 3-hour fire walls.
10. Individual twisted pairs and shielding, as required per fire alarm system manufacturer.
11. UL 66, 83, 1424, 1569, 1581, and 2556 listed.
12. NEC 300.22, 362, 330, 430.2, 501, 502, 503, 530, 504, 505, 518, 530, 645, 725, 760, 760.154(A) compliant
13. AFC Type MC Fire Alarm/Control Cable.

C. Non-Power –Limited Circuits: Solid copper conductors with 600v rated, 75°C, color coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

2.8 IDENTIFICATION

- A. Coordinate names, abbreviations and other designations used with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical systems and equipment.
- B. Delay installation of identification until painting is complete.
- C. Comply with governing regulations and requests of governing authorities for identification of work.
- D. Install engraved plastic-laminate nameplates on all electrical boxes and cabinets installed under this contract (black letters on white background).
- E. Where conduit is exposed, apply identification on conduit. Except as otherwise indicated, use permanent vinyl, self-adhering markers with black letters on orange background.
- F. Apply self-adhering vinyl or heat-shrink plastic cable/conductor identification markers on

each cable and conductor in each box, enclosure or cabinet where wires of more than one circuit are present, except where another form of identification (such as color-coded conductors) is provided. Match identification with marking system used in panelboards, shop drawings and contract documents.

- G. All field installed control circuits shall have tubular sleeve-type wire markers at each end of the circuit and at all splice points. Wire markers shall be permanently stamped with a numbering system selected by the Contractor. The numbering system shall be thoroughly documented and provided to the Engineer.
- H. Dymo (or equivalent) labels shall not be used.
- I. Ceiling Markers: Provide labels on ceiling grid for accessible electrical equipment that is installed above the ceiling.

2.9 PROJECT OPERATION AND MAINTENANCE MANUAL – ELECTRONIC FILES

- A. Project O & M Manual File: The project OM Manual shall include one (1) electronic copy of each approved submittal and any manufacturer's maintenance manuals, and all warranty certificates included in Division 28. Also include the address, phone number and contact person for each supplier. Using the current UMB Standard O&M Manual Template referenced in Division 01 Closeout Procedures insert the submittal files include bookmark and tree structure for accessing each submittal file in the manual.

2.10 COMMISSIONING NEW FIRE ALARM, SAFETY

- A. Test Equipment: Refer to Division 01 Section 019113 "General Commissioning Requirements" for requirements pertaining to testing equipment.

PART 3 – EXECUTION:

3.1 GENERAL REQUIREMENTS – EXECUTION

- A. All construction work that creates excessive noise will not be permitted during normal business hours. See Division 01 Specification Section "Cutting and Patching" for requirements.
- B. General provisions of the contract apply. All work performed and materials provided shall conform to all applicable codes and standards and the National Electrical Code (NEC).
- C. Prior to starting work, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

- D. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing all doors and passageways.
- E. Confirm the locations of all existing utilities. Repair any damage to existing utilities caused by construction forces.
- F. Leave all areas broom clean daily. Remove all construction debris and trash from the site daily.
- G. Before ordering any materials or equipment, submit to the engineer data for all materials and equipment. Check equipment dimensions of proposed substitute equipment. The cost of any redesigning caused by a substitution shall be borne by the Contractor.
- H. Contractor shall do all cutting, drilling and patching required by his work. All repairs to finish shall be of like kind, color and quality as existing. Structural members shall not be cut without approval from the architect.
- I. Take necessary precautions to protect building's occupants and contents, and prevent the spread of dust and dirt into occupied areas.

3.2 SLEEVES

- A. Non-Fire-Rated Sound Proof Partition Penetrations: Where new and existing conduits pass through interior partitions with sound proofing provide a pipe sleeves. Seal the annular spaces between construction openings, the sleeves, and conduits with sound proof insulation material equal to the width of the opening. The sound proof insulation shall match the insulation in the partition.

3.3 CONTRACT DOCUMENTS:

- A. Contract drawings for the work are diagrammatic, intended to convey scope and general arrangement.
- B. Correction of faulty work due to resolving discrepancies without authorization shall be the responsibility of the Contractor.
- C. Should the Contractor discover any discrepancies or omissions on the drawings or in the specifications, he shall notify the Engineer of such conditions prior to the bid date. Otherwise, it will be understood that the drawings and specifications are clear as to what is intended and shall be as interpreted by the Engineer.

3.4 COORDINATION:

- A. Coordinate all work and cooperate with all other trades to facilitate execution of work.

3.5 GENERAL WIRING REQUIREMENTS

- A. Door Hardware: Door hardware is provided and installed under Division 8 of these documents. The security contractor shall coordinate with the Division 8 contractor for the locations of all door hardware requiring connections to the security system and shall provide all connections between power supplies and the locking equipment.
- B. Method of Wiring
1. General: Wire each alarm, trouble, and supervisory signal, initiating circuit, communication circuit, and each security notifying appliance circuit for supervised operation.
 2. Wiring within Cabinets: Provide wiring within cabinets installed parallel with or at right angles to the sides and back of the enclosure. All conductors which are terminated, spliced, or otherwise interrupted in any enclosure associated with the security system shall be connected to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. Make all connections with either crimp-on terminal spade lugs or approved pressure type terminal blocks. Terminal blocks shall be secured in each junction box to the junction box cover plate.
 3. Interior Work: Cables installed in plenums shall meet UL 910, and cables to be installed in risers shall meet UL 1666.
 4. Installation in Ducts or Conduits: A cable lubricant compatible with the cable sheathing material shall be used on all cables pulled. Pulling fixtures shall be attached to the cable strength members. If indirect attachments are used, the grip diameter and length shall be matched to the cable diameter and characteristics. If indirect attachment is used on cables having only central strength members, the pulling forces shall be reduced to ensure the fibers are not damaged from forces being transmitted to the strength member. During pulling the cable pull line tension shall be continuously monitored and not exceed the maximum tension as given by the cable manufacturer. The mechanical stress placed upon a cable during installation shall not twist or stretch the cable.
 - a. A cable feeder guide shall be used between the cable reel and the face of the duct or conduit to protect the cable and guide it into the duct or conduit as it is played off the reel. As the cable is played off the reel, it shall be carefully inspected for jacket defects. Precautions shall be taken during installation to prevent the cable from being kinked or crushed and the minimum bend radius of the cable is not exceeded at any time. Cable shall be hand fed and guided through each manhole and additional lubricant shall be applied at all intermediate manholes.
 - b. When practicable, the center pulling techniques shall be used to lower pulling tension. That is, the cable shall be pulled from the center point of the cable run towards the end termination points. The method may require the cable to be pulled in successive pulls. If the cable is pulled out of a

- junction box or manhole the cable shall be protected from dirt and moisture by laying the cable on a ground covering.
5. Vertically Run Cable: When possible, use gravity to assist in cable pulling; pull cable from top of run to bottom of run. Hand-pull cables if possible; if machine assistance is required, monitor tension and do not exceed the specific cable tension limits. After installation, the vertical tension on the cable shall be relieved at maximum intervals of 30.48 m (100 ft) using a split support grip.
 6. Cable Taps: The Contractor shall provide a terminal cabinet where any circuit tap is made.
 7. Color Coding: The Contractor shall distinctively color code all wiring differently from the normal building wiring. Identify conductors by plastic-coated, self-sticking, printed markers or by heat-shrink type sleeves. Wire the alarm initiating and notification signal devices so removal will cause the system trouble device to sound. Each conductor used for the same specific function shall be distinctively color coded. Use two (2) different color codes for each interior alarm circuit; one (1) for each loop. Each circuit color code wire shall remain uniform throughout the circuit.
 8. Termination: End-of-line supervisory resistors or devices are to be provided at the sensor device location. The end of line resistor network shall be per manufacturer's recommendations; in the absence of such, it shall consist of two (2) 1k resistors, one (1) across the normally closed contact of the device and the other in series with the normally closed circuit. See drawing details for further information. Use of GRI Resistor Packs is preferred.
 9. No "stick-on" cable ties shall be used within the enclosure.

C. Cable Installation

1. All field wiring required for interconnection of the various security system components shall be installed within conduit.
2. All circuits shall be protected to avoid interruption of service due to short-circuiting or other conditions which may adversely affect the connecting devices. Each individual signaling circuit shall be classified as a circuit pair.
3. Screw terminal blocks or connectors shall be furnished for all cables which interface with racks, cabinets, consoles or equipment modules. No more than 2 mm of exposed bare wire may show when either crimped or fastened to a connector block or terminal strip.
4. Care shall be exercised in wiring to avoid damage to the cables or the equipment. All joints and connections shall be made with mechanical butt splice connectors. The crimping tool used shall be recommended by the manufacturer. Wire nuts shall not be an acceptable splice method.
5. To reduce the possibility of signal contamination, all cables shall be grouped according to the signals being carried. The horizontal and vertical cable runs should be bundled or grouped as follows:
 - a. Low Voltage Power
 - b. Signal, Control Cables, and Video Cables

6. All cabling shall be U.L. listed for its intended application and meet or exceed the standards as recommended by the manufacturers of the components being interconnected. All shielded cabling used shall be 100 percent shielded.
7. All system wiring shall be installed in accordance with the instructions provided by the manufacturers of the components being used in the system and in accordance with codes, specifications, and standards as referenced herein.
8. Splices shall not be permitted in system wiring between components which are incorporated in the system. Wiring runs must terminate at either a system component or a junction box where wiring is interconnected using terminal strips or connectors. Wire ends shall be prepared for attachment to component terminals in accordance with the recommendations of the equipment manufacturers. If there is no alternative and a wire/cable splice must be made, the Contractor shall notify the OWNER and request approval through a formal RFI process prior to making the wire splice.
 - a. The RFI shall include the following:
 - 1) The Contractor shall identify the device and/or system affected by the proposed splice and why the splice is required.
 - 2) Provide in detail the methodology which shall be utilized for the wire/cable splice. A diagram may be used to demonstrate methodology but shall not replace the written methodology requirement.
 - 3) If splicing is required for more than five (5) wires/cables, a formal wire management plan shall be developed to provide methodology for maintaining wire/cable consistency and performance.
 - 4) In all instances the Contractor shall provide the OWNER with a mock-up of the proposed splice and samples of the materials to be used.
 - 5) The Contractor shall not proceed until written approval has been received from the OWNER for the splice and the splice materials.
 - b. The following criteria shall be utilized for installing wire/ cable splices.
 - 1) Twist type connectors shall not be used for wire splicing.
 - 2) Wire splices shall be made on binding screw captive mechanical compression terminal strips.
 - 3) Soldered and crimped connections are allowed and shall be accomplished with crimping Lug Manufacturers Calibrated Tool.
 - 4) Solder connections shall be applied in accordance with BICSI standards.
 - 5) Mechanical splices shall utilize a UL listed ratchet type connector. The Contractor shall select the appropriate connector size based on gauge of the wire/cable being spliced. The Contractor shall only use manufacture approved full cycle ratchet crimping devices.
 - 6) The Contractor shall utilize appropriately sized UL listed heat shrink tubing. Splices shall be encapsulated with an epoxy or ultraviolet

- light cured splice encapsulator, particularly if the spliced wire/cable is direct-buried, environmentally exposed, or located in an exterior hand hold.
- 7) The Contractor shall ensure all completed splices are accessible. Splices shall be made in lockable/tampered security enclosures or in security junction/pull boxes. At no time shall spliced wires/cables be permitted to be pulled into the conduit system.
 - 8) All spliced wires/cables shall be tested in witness of the OWNER to ensure system performance is not adversely affected by the splices' presence.
- c. All copper conductor splices shall be accomplished in the following method:
- 1) Strip insulation from wires to be spliced using caution not to score or strip away the actual conductor.
 - 2) Twist together the stripped conductors for a minimum of four rotations.
 - 3) Solder the twisted conductors using rosin core solder.
 - 4) Trim the twisted and soldered conductors to a length accommodated by the vinyl insulated closed end splice or butt splices in the next step. Trimmed bare conductors shall not extend beyond the insulated closed end splice (or equal).
 - 5) Crimp insulated closed end splice utilizing a full cycle ratchet crimp tool approved by the splice manufacturer. The crimped connections shall be free of any movement between the wire and crimp splice device.
9. Connections at devices shall be soldered or fastened with approved crimp connectors. No wire nuts will be permitted. Wire should be twisted four times before a crimp connector is applied. The Manufacturers crimping tool shall be utilized for the crimp connectors of choice. Environmental connectors shall be used in harsh or outdoor environments. Devices requiring connections within metal extrusions associated with perimeter windows and doors are considered to be a harsh environment.
 10. All mounted wire ties shall be the screw down type. Wire ties utilizing only an adhesive back are not acceptable.
 11. Heat shrink tubing must be installed on all cable ends within cabinets.
 12. Cable shields are to be grounded only for alarms. Shields are to be carefully insulated to prevent conductor shorts.

3.6 INSTALLATION – FIRE ALARM SYSTEM

- A. All field wiring shall be installed in conduit. Conduit and boxes shall be sized according to National Electrical Code requirements based on the number of conductors. Initiating device circuit wiring shall be two-conductor twisted with integral shield and ground. Indicating appliance circuits shall be minimum 14 AWG. Provide new wiring as necessary and extend

and connect to the nearest SLC/NAC loop. **Do not T-TAP to existing wiring. T-TAP is not allowed.**

- B. Fire alarm circuits shall be identified by red junction box covers stenciled in white letters "fire alarm". Fire alarm wiring shall be color coded in accordance with requirements of local authority having jurisdiction.
- C. Final Acceptance test shall be witnessed by the UMB Fire Marshal.
- D. Prior to testing of the system with UMB Fire Marshal, the contractor shall conduct pre-testing of the system and correct all deficiencies.
- E. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- F. Tests and Inspections:
 - 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
 - b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
- G. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- H. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- I. Prepare test and inspection reports.
- J. Contractor Pretesting: After installation, align, adjust, and balance system and perform complete pretesting. Determine, through pretesting, compliance of system with requirements of Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones, and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results. Provide documentation summarizing pretesting to UMB Fire Marshal. Documentation should include statement that system is working properly and summary of corrections made during pretesting. Project Manager may attend contractor pretesting as desired.

- K. The contractor shall have a fire alarm technician present during all tests and shall have laptop with them to modify and program changes during the tests.
- L. Final acceptance testing with the UMB Fire Marshal: After installation, align, adjust, and balance system and perform complete pretesting with the University Fire Marshal. Determine, through pretesting, compliance of system with requirements of Drawings and Specifications. After pretesting is completed, correct deficiencies observed in pretesting for final testing. Replace malfunctioning or damaged items with new ones, and retest until satisfactory performance and conditions are achieved. Remove existing devices after pretesting has been completed with the UMB Fire Marshal.
- M. Final acceptance testing: After final acceptance testing is complete, provide letter certifying installation is complete and fully operable, including names and titles of witnesses to preliminary tests.
- N. Final Test Notice: Provide minimum of ten business (10) days' notice in writing when system is ready for final acceptance testing.
- O. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by system test that total system meets Specifications and complies with applicable standards.

3.7 FEES

- A. A fee applies if testing with the Fire Marshal reveals that the fire alarm system does not meet applicable codes and standards, the project specifications and/or the design documents. Each failed test will result in a \$250 fee.
 - 1. If any programming changes are required during the test or after, the test is considered a failed test.
 - 2. Any issue that requires re-testing is considered a failed test.
 - 3. Any test in which the contractor fails to show at the scheduled start time or is not prepared to perform the test with testing materials is considered a failed test.
- B. Invoices will be sent to the contract holder from the University of Maryland, Baltimore Central Administration Support Services (CASS) Department. Payment must be made electronically with credit card or via check. Cash payment is not acceptable.
- C. Failure to pay the fee within 30 days of receipt will result in appropriate administrative and/or legal action. Further inspection or testing may not take place until the fee is paid in full. This may result in delay of the issuance of a use and occupancy permit for the building or facility.

3.8 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No. 14 AWG.
2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.9 FIRESTOPPING

- A. Apply fire stopping to penetrations of fire-rated floor and wall assemblies for electronic security installations to restore original fire-resistance rating of assembly.
- B. Comply with TIA/EIA-569-A, "Firestopping" Annex A.
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.10 GROUNDING

- A. For communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. For low-voltage wiring and cabling, comply with requirements in Division 26.

3.11 CABLE IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26.

3.12 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
4. Optical Fiber Cable Tests:

- a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- b. Link End-to-End Attenuation Tests:
 - 1) Multimode Link Measurements: Test at 850 or 1,300 nm (wavelength) in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
 - 2) Attenuation test results for links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
- B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide or transfer the data from the instrument to the computer, save as text files, print, and submit.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.13 WIRELINE DATA TRANSMISSION

- A. Installation: The Contractor shall install all system components including Owner furnished equipment, and appurtenances in accordance with the manufacturer's instructions, ANSI C2 and as shown, and furnish all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable data transmission system.
- B. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all testing.

3.14 DEMOLITION

- A. The demolition in the renovation areas indicated on the drawings shall be complete and include all work in the area unless noted otherwise.
- B. Existing systems passing through areas of demolition to serve equipment beyond the demolition areas shall remain in service, or be suitably relocated and restored to normal operation, throughout the demolition and reconstruction of the area. The Contractor shall investigate and identify such equipment prior to demolition.
- C. Provide temporary service to equipment disturbed by the demolition until such time as the permanent service can be restored.
- D. Where conduit and wiring is to remain are inadvertently damaged or disturbed, cut out and remove damaged portion and all damaged wiring from the source to the destination connection point. Provide new wiring of equal capacity.

- E. Exposed conduit to be demolished shall be removed in its entirety. Concealed conduit, abandoned in place, shall be cut out approximately two (2) inches beyond the face of adjacent construction, plugged, and the adjacent surface patched to match existing.
- F. Wiring to be demolished shall be removed from both concealed and exposed conduit. No wiring which becomes unused as a result of the contract shall be abandoned in place.
- G. Equipment specified or indicated to be demolished, shall be removed from the project site and shall not be reused.

3.15 COMMISSIONING NEW FIRE ALARM, SAFETY

- A. Testing Preparation:
 - 1. Certify in writing to the CxA that the systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
 - 2. Place systems, subsystems, and equipment into operating mode to be tested.
 - 3. Inspect and verify the position of each device and interlock identified on checklists.
 - 4. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.
- B. General Testing Requirements:
 - 1. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.
 - 2. Test all operating modes and verify proper response of controllers and sensors.
 - 3. Tests will be performed using design conditions whenever possible.

3.16 CUTTING AND PATCHING

- A. Cutting and patching associated with the work in the existing structure shall be performed a neat and workmanlike manner. Existing surfaces that are damaged by the contractor shall be repaired or provided with new materials to match existing.
- B. Structural members shall not be cut or penetrated. Holes cut through concrete and/or masonry to accommodate new work shall be cut by reciprocating or rotary, non-percussive methods.
- C. Patching of areas disturbed by installation of new work and/or required demolition shall match existing adjacent surfaces as to material, texture and color.

3.17 CLEAN – UP

- A. Excessive debris and dirt, such as occurs from cutting through masonry or plaster walls shall be cleaned up from the equipment and removed immediately after the work of cutting through the walls.
- B. Debris shall be removed from UMB property.
- C. Ceiling panels shall be replaced as soon as work is finished in the area, and shall be kept free of dirty finger prints. Where work is being done in corridors used by patients and visitors, ceiling panels shall be replaced at the close of the day's work even if work is at the particular location is incomplete.
- D. All areas shall be left broom-clean at the end of the work period.

END OF DIVISION 280000