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BuildingName
The Description of the Project
P00000000 0000

SPECIFICATION DIVISION 1

NUMBER SECTION DESCRIPTION

DIVISION 01 GENERAL REQUIREMENTS

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017420 CONSTRUCTION AND DEMOLITION WASTE TRACKING.
1/21/2026 - UPDATED SECTION 011400 WORK RESTRICTIONS/PARKING ON
U-M PROPERTY

DIVISION 01 GENERAL REQUIREMENTS
SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings and the general provisions of the Contract, including the current edition of the University of Michigan Standard General Conditions apply to each section of this Project's specifications.

1.2 PROJECT DESCRIPTION

- A. The Project: Remodel approximately **insert** sq. ft. of existing **insert next or modify** laboratory and office space in rooms **insert room numbers** in the **insert name** Building on the University of Michigan's **insert next or modify** Medical Central North South (athletic) Campus in Ann Arbor, Michigan. Major aspects of the work include, but are not limited to:
1. Demolition of existing structures as required for new construction.
 2. Removal, abatement, and proper disposal of existing asbestos containing materials, lead containing materials, PCB containing materials, and regulated building materials.
 3. Construction of new masonry and drywall/metal stud walls and partitions.
 4. Interior and exterior doors and hardware.
 5. Architectural finishes
 6. Laboratory furniture and pre-packaged controlled environmental room.
 7. Revision of existing HVAC system, including new fume-hood exhaust system.
 8. New plumbing work, including natural gas, vacuum, domestic hot and cold water, purified water piping, and drainage, waste and vent plumbing.
 9. Fire protection piping.
 10. Electrical lighting and power.
 11. Alarm and telecommunications systems.
- B. The building in which the project is located is under the jurisdiction of the State of Michigan Bureau of Fire Services (BFS).
- C. The compartment of the building in which the project is located is not under the jurisdiction of the State of Michigan Bureau of Fire Services (BFS). There are compartments in the building that are under the jurisdiction of the State of Michigan Bureau of Fire Services (BFS). Submit fire alarm and fire suppression work to the State of Michigan and request related inspections.

1.3 WORK SEQUENCE

- A. Work Sequence (Phasing): Conduct the Project in phases to provide the least possible interference to activities of the Owner's personnel, and to permit the orderly transfer of personnel and equipment to the new facilities.

1. Achieve Substantial Completion (ready for Owner's occupancy) in room 10 before beginning work in room 20; achieve Substantial Completion in room 20 before beginning work in room 30.
- B. Notify Owner's Representative 7 calendar days prior to scheduled date of Substantial Completion of each phase of the Project. Before beginning successive phases of Work, comply with the following requirements:
 1. Obtain Architect's Certificate of Substantial Completion for the completed phase of Work.
 2. Allow 7 calendar days before beginning next phase, to permit Owner to prepare space for use.

1.4 WORK UNDER OTHER CONTRACTS

- A. During the Contract Time, additional construction work under separate contract will be taking place. Major aspects of work under other contracts are indicated on Drawings. Coordinate construction operations and cooperate with Owner and other contractors to minimize possible conflicts. Contact The University of Michigan Construction Management Department (734) 764-2457 for further information.

1.5 WORK BY OWNER

- A. Shut-down and restoration of utilities, including plumbing, fire protection (and Owner's implementation of Red Tag Permit system), HVAC, electrical, fire alarm, or other services that require temporary discontinuation and later restoration shall be conducted by Owner's Maintenance personnel. Contractors are not authorized to impair any services. Contact the Maintenance Department through the Owner's Representative.
- B. During the Contract Time, additional construction work performed by Owner will be taking place. Major aspects of work under other contracts are indicated on drawings. Coordinate construction operations and cooperate with Owner to minimize possible conflicts.
- C. During the Contract Time, Asbestos Abatement Work will be performed by Owner. The Contractor shall coordinate the Work performed by the Owner and Owner's Asbestos Abatement Sub-contractor, if any. Refer to Division 02 Section for information on Abatement Work to be performed by Owner.

1.6 PRODUCTS ORDERED IN ADVANCE

- A. Owner has pre-ordered and paid for the products indicated below. Work of this Contract includes unloading, handling, storing, setting, installing and making building service connections. Contractor responsible for payment of State of Michigan use tax on equipment cost listed below.
 1. Unit substation:
 - a. Approximate delivery date:
 - b. Equipment Cost:
 2. Irrigation central control components, excluding piping.
 - a. Approximate delivery date:
 - b. Equipment Cost:

B. Coordinate exact time and date of delivery with equipment manufacturer.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 011000

SECTION 011400 - WORK RESTRICTIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Types of special construction requirements include the following:
 - 1. Use of premises.
 - 2. Security.
 - 3. Parking on U-M property.
 - 4. Scheduling of work.
 - 5. Drone use.
 - 6. Refrigerant handling.
 - 7. Tunnel projects.
 - 8. Medical School facilities.
 - 9. Noise and vibration control.
 - 10. Animal rooms.
 - 11. Student housing.
 - 12. Fume hood ductwork demolition.
 - 13. Protections when using epoxy coatings.
- B. This Section contains requirements that apply to Divisions 01 through 14 and Divisions 21, 22, 23, 26, 27, 28, 31, 32 and 33 of the specifications.
- C. Related Work of other Sections:
 - 1. Division 01 Section "Summary" for general restrictions on site use.
 - 2. Division 01 sections "Temporary Facilities and Controls" and "Temporary Tree and Plant Protection"

1.2 DEFINITIONS:

- A. Work Hours: 7:00 AM through 5:00 PM, Monday through Friday.
- B. Business Hours: 8:30 AM through 5:00 PM, Monday through Friday.
- C. Off-Hours: Hours outside of Work Hours defined above.
- D. Early morning Hours: 7:00 AM through 8:30 AM, Monday through Friday.

1.3 USE OF PREMISES

- A. Coordinate use of premises under direction of the Owner's Representative.
 - 1. The building in which Project is located will be continuously occupied during construction. Coordinate construction efforts with Owner to minimize interference with Owner's operations.
 - 2. Provide and maintain access of Owner's personnel to toilets, telephone closets and janitor closets on Owner-occupied floors throughout Contract Time.
 - 3. Maintain emergency egress routes for Owner's personnel as directed by Owner's Representative.

4. Existing toilets designated by Owner may be used by Contractor's personnel for personal use only during construction. Do not use toilet facilities to conduct construction operations without written permission of Owner's Representative.
 - a. If use of toilets for construction activities is permitted by Owner's Representative, clean toilet facilities daily.
5. Contractor's personnel are prohibited from using toilets facilities during construction. Provide temporary toilet facilities for construction personnel. Coordinate location with Owner's representative.
6. Contractor's staging area is strictly limited to areas indicated on the drawings. Where no staging area is indicated, Contractor's use of site is limited to areas within the Contract bounds, or as reasonably required to complete the Work. Strictly comply with Owner's Representative's directions establishing staging and operation areas, through-building routes, and locations for material delivery and disposal.
7. Smoking is prohibited in all University of Michigan buildings and grounds, including, Project site, mechanical rooms, utility spaces, and roof tops.

1.4 SECURITY

- A. Purchase University-provided photographic identity badges for each person engaged in on-site work and ensure that workers wear badges at all times on University property. Purchase cost per badge is \$4.00. Coordinate through Owner's Representative.

1.5 PARKING ON U-M PROPERTY

- A. Arrange parking for Contractor's personnel in accordance with Article 1.6 of the University of Michigan Standard General Conditions.
- B. The Owner has designated the use of U-M parking lots based on project location and size. This is the only U-M parking that will be made available to the Contractor for this project.
 1. Central Campus and Ross Athletics projects
 - a. Lot SC17, at the corner of South State Street and E. Eisenhower Parkway at the west end of the Wolverine Tower site.
 - b. This lot requires a U-M yellow monthly parking permit.
 - 1) The cost and arrangement for purchase of permits for U-M parking shall be the Contractor's responsibility. The Owner will not repay the Contractor for parking for this project.
 - 2) Parking availability and permits are provided on a first-come, first served basis and are not guaranteed.
 - 3) Contractors can email umpark@umich.edu to request purchase of a permit.
 2. North/Medical Campus projects
 - a. Unpaved parking lot at the corner of Plymouth Road and Green Road (north of lot NC37).
 - 1) Parking in NC37 is not permitted.
 - b. No permit required.

- C. Campus parking is not provided for this project, contractor to secure off -site parking.
- D. The Owner will allow use of standard U-M bus services for contractor personnel between the above designated lot and the jobsite at no cost to the Contractor. The U-M bus follows an existing schedule and route that may not go directly to, nor stop directly in front of the jobsite. The U-M bus frequency and bus routes can be obtained from the U-M Parking Customer Services office or the LTP website (<http://ltp.umich.edu/transit/routes.php>).
- E. The Contractor shall not transport materials or tools on U-M or AAATA busses.

1.6 SCHEDULING OF WORK

- A. Schedule work with Owner to fit Owner's operations, to facilitate completion of this work, to coordinate with and expedite new construction work on project, and as follows:
 - 1. Schedule with Owner work that interferes with facility operation, including shut-off of mechanical and electrical services and encumbrance of Owner's ingress and egress routes and normal operation. Provide the following notice of planned interruption of services:
 - a. Provide not less than 10 working days notice before interruption, with final confirmation not less than 72 hours before interruption.
 - 2. When permitted by Owner's Representative to deliver items of equipment to Owner's loading dock facilities, schedule such deliveries in advance with Owner. Provide minimum 1 business day notice prior to planned delivery time of equipment.
 - a. Dock hours: < >
 - b. Permitted delivery hours: < >
 - 3. Schedule work during Work Hours unless otherwise approved by Owner.
 - 4. Schedule and coordinate construction operations to achieve Substantial Completion, ready for Owner's occupancy, by the date listed in the form of proposal.
- B. Start of Operations: Do not commence work before insurance and bonds have been submitted to Owner.

1.7 DRONE USE

- A. The use of unmanned aircraft systems (drones) is regulated by the Regents Ordinance-Article XV. Outdoor use of drones on U-M property is prohibited.

1.8 REFRIGERANT HANDLING

- A. Refrigerant Installation and Disposal: Perform all work related to refrigerant contained in chillers, cooling coils, air conditioners, and similar equipment, including related piping, in strict accordance with the following requirements:
 - 1. ASHRAE Standard 15 and Related Revisions: Safety Code for Mechanical Refrigeration.

2. ASHRAE Standard 34 and Related Revisions: Number Designation and Safety Classification of Refrigerants.
 3. United States Environmental Protection Agency (US EPA) requirements of Section 808 (Prohibition of Venting and Regulation of CFC) and applicable State and local regulations of authorities having jurisdiction.
- B. Comply with Owner's tracking procedure for CFC and HCFC refrigerants. When new refrigeration equipment is installed, or when refrigerant is disposed of, complete the "Refrigerant Disposal Form". Copies of the form are available from Owner's Facilities and Operations Mechanical Systems Program Manager. Contact (734) 647-2041. Submit completed forms to the Owner's Representative and Air Conditioning Shop.
1. For new refrigeration equipment, the following information is required: Unit location, area served, make, model and serial number of unit, refrigerant type and quantity.
 2. For removed refrigeration equipment, the following information is required: Unit location, area served, make, model and serial number of unit, refrigerant type and quantity. Removed refrigerant shall become the property of the Contractor.

1.9 TUNNEL PROJECTS

- A. Tunnel Access: As shown on drawings.
- B. Construction Energy: Use of electric arc welders is permitted at the discretion of the Owner, subject to verification of adequacy of power source.
1. Notify the Owner of the expected electrical consumption per welding rig and the number of rigs proposed for use.
 2. The Owner will identify sources of limited amounts of both 120 VAC, single phase, electric power, and compressed air, from existing distribution systems.
 3. Tie into the identified sources for power and compressed air only in the presence of Owner's personnel.
- C. Safety Requirements: Perform work within tunnels in strict compliance with the published requirements of Owner's Environment, Health and Safety (EHS) department. Copies of requirements are available from the Safety Division of Owner's EHS department.
- D. Contractor shall notify Department of Public Safety Dispatch at 734-763-1131 prior to entering and after exiting the tunnel system.

1.10 MEDICAL SCHOOL FACILITIES

- A. Scheduled Suspended-Work Periods: The University's Medical School conducts noise sensitive research and regularly scheduled academic examinations throughout the year. Certain construction operations are expected to result in noise, vibration, utility shut-offs, and other nuisances that will negatively affect the examination environment.

1. Upon request of the Owner's Representative, suspend activities conducted within the indicated areas that produce noise, vibration, and other nuisances, or that otherwise have, in the opinion of the Owner, the potential to disturb Medical School research and examinations:
 - a. The precise dates, times, and durations of the work suspension periods are unknown. The Owner's Representative will provide full details of each required work suspension not less than 7 calendar days prior the beginning of the suspension.
 - b. Include in the construction schedule 20 working days, of eight hours each, of suspended work time within the areas indicated.
- B. Daily Cleaning Program: In public areas, including lobbies, corridors, elevator cabs, and similar areas used for construction traffic, but outside the limit of the Project, comply with the following:
 1. Either at the end of each working day or before 7:30 AM each working day, broom clean floors using commercial cleaning compound. Wet mop floors after broom cleaning to completely remove dirt, dust, and scuff.
 2. Storage of construction related materials and equipment, including temporary storage of all types, is prohibited outside the Project limits.
- C. Nuisance Control Program: Schedule dust, noise, vibration, and fume generating activities during Off Hours. Applicable nuisance-generating activities include:
 1. Demolition work, including cutting, coring, asbestos abatement, and debris removal operations.
 2. Use of gasoline or diesel-powered vehicles or equipment.
 3. Utility shut-downs and tie-ins.
 4. Fume/odor generating construction activities, including application of non-water-based paints, epoxy coatings, resinous flooring and similar materials that release significant quantities of volatile organic compounds during application and cure.
 5. Construction activities in public areas (including corridors, lobbies and stairs) outside the immediate Project limits.
 6. Delivery of materials to site and trucking of debris from site.
 7. Transportation of construction materials and debris through public areas (including corridors, lobbies and stairs) to and from immediate Project limits.

1.11 NOISE AND VIBRATION CONTROL

- A. Noise-Vibration Restrictions: Noise- and vibration-sensitive research will be conducted for the duration of the Project.
 1. Demolition operations are restricted to Off-Hours.
 2. Terminate disruptive work during the times and dates listed below:
 - a. <>

3. Arrange a system of notification with Owner's Representative that will provide building occupants not less than 24 hours warning of performance of construction operations that will cause noise and vibration.
4. Conduct demolition work in a single, continuous operation. Complete demolition work within 7 calendar days from start of demolition operations.
5. Plan, schedule and perform work during evenings and weekends, at no additional cost to Owner, as required to achieve completion of floor slab demolition within indicated time.

1.12 ANIMAL ROOMS

- A. For work conducted in animal rooms, comply with the following special scheduling requirements:
 1. Schedule work in designated Animal Rooms during Work Hours.
 2. Unless other arrangements have been agreed to by Owner in writing, Contractor's personnel shall not enter designated Animal Rooms until each of the following conditions are met:
 - a. Contractor has coordinated work with Medical School Facilities Management and Planning. Contact the Medical School Facilities Department, located in room 1590 of Medical Science Research Building (MSRB) II, at (734) 747-2788.
 - b. Owner has removed animals from each room in which work is to be performed.
 - c. Owner's personnel have cleaned each room in which work is to be performed and notified Contractor that each room is ready.
 - d. Contractor's personnel are properly attired in clothing provided by Owner. Attire is required for the protection of the sterile environment provided for research animals. Contractor's personnel should not expect to encounter substances or contaminants hazardous to humans, unless otherwise informed by Owner.

1.13 STUDENT HOUSING

- A. The building will be occupied and used as a residence throughout the construction period.
- B. Comply with the following special safety and security requirements for work conducted within student occupied buildings and areas:
 1. Schedule Work during the Work Hours, with the following restrictions:
 - a. Occupied Buildings: Do not begin work that will generate noise or vibration before 9:00 AM.
 - b. Study and Exam Days: No work will be permitted during officially designated study and exam days. Study and exam days include:
 - 1) <>
 2. Building Access: During Business Hours, notify Owner's Representative for access to Project site.

- a. Individual areas can be opened as often as once each day by the Owner's building facilities manager. When more frequent daily access is required, or when access is required for more than 5 working days, obtain keys from the Housing Security Department, or from the University Key Office. Use keys to obtain access to areas in strict compliance with approved construction schedule issued to Housing Security. When working in more than one area, check with the building facilities manager to ensure no scheduling conflicts exist.
 - b. Building access outside of Business Hours is available only with the written approval of the Owner's Representative. Coordinate access with the Owner's Representative and the Owner's Public Safety Department.
3. Personal Conduct Restrictions: Employees of the Contractor and subcontractors shall comply with the following restrictions regarding personal conduct while on University of Michigan property:
 - a. Harassment: Conduct considered by the Owner as harassing is strictly prohibited, including the use of profanity; or the use of derogatory or demeaning gender- or race-related comments or actions. The Owner reserves the right to require the Contractor, at no additional cost to the Owner, to remove from the Project all personnel who violate this policy.

1.14 FUME HOOD DUCTWORK DEMOLITION AND MODIFICATION

- A. Existing fume hood ductwork may have been corroded by exposure to a variety of chemicals during its use.
- B. Ensure that all personnel engaged in demolition or modification of fume hood ductwork wear indicated personnel protective equipment (PPE).
- C. PPE is prudent and precautionary only; it does not suggest an inherent health hazard from the ductwork.
- D. In addition to standard OSHA and MIOSHA safety gear (such as hard hats, steel-toed footwear and similar items), PPE includes the following:
 1. Leather gloves for dry conditions; rubber over-gloves for wet conditions.
 2. Safety eye wear to prevent dust or debris from falling into the eyes.
 3. Protective outerwear to protect against dust or debris contact with skin.

1.15 PROTECTIONS WHEN USING EPOXY COATINGS

- A. The building will be occupied during construction.
- B. Comply with the following requirements for Work involving the application of solvent-borne epoxy coatings or high-build epoxy products:

1. Protect the work area where the epoxy coatings are applied. Provide temporary barrier enclosures around the work area consisting of 8 mil polyethylene sheeting supported by wood or metal studs. The joints in the sheeting and the perimeter of the barriers must be sealed.
2. Provide temporary equipment to ensure that the work area is under negative pressure relative to the rest of the building. Ventilation must be sufficient to prevent a build-up of excessive vapors inside the enclosure during the application and curing of epoxy. The ventilation must be operational 24 hrs/day until completion of epoxy application and curing.
3. Provide seven days' notice prior to the beginning of epoxy application. The Owner's Representative shall schedule a meeting to coordinate activities required to achieve the protection requirements indicated above and to determine whether air quality monitoring will be performed during epoxy application. Attendees at the meeting shall include the General Contractor, the Subcontractor for the epoxy application, the Owner's Representative and a representative of the University of Michigan's Environment, Health and Safety Department (EHS).
4. Provide waste disposal plans to Owner's Representative for review and approval by UM EHS. Waste materials that have been in contact with products containing solvents must be disposed as hazardous waste.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 011400

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Selected materials are shown and specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials to a later date. Additional requirements, if necessary, will be issued by Change Order.
 - 1. Cash Allowances: Contractor's costs for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the allowance shall be included in the Contract Sum and not in the allowance.
- B. Type of allowance is "Lump-sum" cash allowance.
- C. General information concerning cash allowances and procedures for submitting and handling Change Orders are included in "Standard General Conditions".

1.2 SELECTION AND PURCHASE

- A. At the earliest feasible date after Contract award, advise the Owner of the date when the final selection and purchase of product described by allowance must be completed in order to avoid delay in performance of the Work.
 - 1. When requested by the Owner, obtain proposals for each allowance for use in making final selections; include recommendations that are relevant to performance of the work.

1.3 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowance, in the form specified for Change Orders.
- B. Submit invoices or delivery slips to indicate actual quantities of materials delivered to the site for use in fulfillment of allowance.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 SCHEDULE OF CASH ALLOWANCES

- A. Cash Allowance: Include a lump sum material cost of \$35.00 per square yard for purchase of carpeting as indicated on drawings and specifications.
- B. Cash Allowance: Include a lump sum material cost of \$425.00 per thousand units for purchase of face brick as indicated on drawings and specifications.

END OF SECTION 012100

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.

1.2 DEFINITION

- A. Unit price: A unit price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order if estimated quantities of Work required by the Contract Documents are increased or decreased

1.3 PROCEDURES

- A. Unit prices include necessary material, overhead, profit and applicable taxes.
- B. Refer to individual Sections
 - 1. For demolition or construction activities requiring establishment of unit prices.
 - 2. For requirements for materials and methods described under each unit price.
- C. Owner reserves the right to reject the Contractor's measurement of Work-in-place that involves the use of established unit prices, and to have this Work measured by an independent surveyor acceptable to the Contractor at the Owner's expense.
- D. List of Unit Prices: A schedule of unit prices is included in the Form of Proposal.
- E. List of Unit Prices: A schedule of unit prices is included in Part 3.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

- A. SCHEDULE OF UNIT PRICE ITEMSUnit Price No. 1: *<Brief Description - match FOP>*
 - 1. *<Detailed description>*
 - 2. Unit of Measure: *< >*
 - 3. Quantity: *< >*

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Notification: Immediately following award of Contract, prepare and distribute to each party involved notification of the status of each alternate. Indicate whether alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to alternates, if any.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Provide the ADD price for <describe the additional work to be added to the base bid scope of work>
- B. Alternate No. 2: Provide the DEDUCT price for <describe the work to be deleted from the base bid scope of work>
- C. Alternate No. 3: Provide the ADD or DEDUCT price for providing_<description> in lieu of <description>.

END OF SECTION 012300

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Additional project coordination, phasing, and scheduling requirements are included in Division 01 Sections "Summary" and "Work Restrictions"

1.2 COORDINATION

- A. Project Meetings: Attend regular meetings with Owner and subcontractors as directed by Owner. Location of meetings will be determined by Owner.
- B. Coordinate inspections and testing of concealed Work to occur prior to concealing that Work.
- C. Coordinate sequencing of Work to occur during conditions of temperature, humidity, exposure, forecast weather, and status of Project completion, which will ensure best possible results for each unit of Work. Isolate each unit of Work from non-compatible Work, as required to prevent deterioration.
- D. Coordinate work between trades for the most efficient sequence of installation, to prevent space conflicts, and to provide clearances required by code, Drawings, and the manufacturer.
 - 1. Minor dimension changes (including the need to adjust finish dimensions), difficult installations and/or the addition of off-set fittings will not be considered changes to the Contract.
 - 2. Obtain approval of the Owner's Representative prior to any changes or alternate configurations.

1.3 COORDINATION DRAWINGS

- A. General: For all Work in areas indicated under scope, prepare coordination drawings with space conflicts resolved, and showing clearances required by code, Drawings, and the manufacturer.
- B. Scope: Provide coordination drawings for the following project areas:
 - 1. Open ceiling areas above 7-feet.
 - 2. Ceiling and above ceiling space.
 - 3. Slab Edge and Embedded Items.
 - 4. Mechanical rooms.
 - 5. Mezzanines and interstitial spaces.
 - 6. Electrical rooms.
 - 7. Shafts.
 - 8. Tunnels.
 - 9. Other spaces where the contractor determines limited space availability necessitates coordination.
- C. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts.
 - 1. General: Show the following on all drawings:

- a. Functional and spatial relationships of components.
 - b. Space / access requirements as indicated by code, on Drawings, and per manufacturer requirements.
 - c. Column center lines, interior partition locations and heights, ceiling heights, and fire rated construction locations.
 - d. Dimensions.
2. Drawing types:
- a. Floor Plans
 - b. Reflected Ceiling Plans
 - c. Plenum Plans: Locate all components within ceiling plenum to accommodate layout of light fixtures and other ceiling mounted items indicated on Drawings.
 - d. Section drawings: As needed to adequately represent the Work.
 - e. Elevations: Locate all equipment, panels, controls, and other wall mounted items in mechanical and electrical rooms.
3. Architectural and structural: Show the following:
- a. Relationships between ceilings mounted devices and the acoustical ceiling grid.
 - b. Sub-framing for support of ceiling, soffit, and wall systems
 - c. Structural penetrations and openings for all disciplines.
 - d. Location and size of access doors.
 - e. Slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
4. Equipment:
- a. Indicate equipment that projects into the above ceiling coordination space.
5. Mechanical and Plumbing Work: Show the following:
- a. Sizes, bottom, and top elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, and cleanouts.
 - c. Fire-rated enclosures around ductwork.
 - d. Location of DDC control panels and major control devices (e.g. flow meters, control dampers, control valves greater than 2")
 - e. Location and pitch for steam, condensate, sanitary, storm, and all other pitched services.
 - f. Space for tube pulls, coil pulls, filter removal, etc.
6. Electrical Work: Show the following:
- a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm device locations.
 - c. Panelboard, switchboard, switchgear, substation transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 - e. Cable trays.

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

D. Process requirements:

1. Base drawings: Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings or to existing conditions.
2. Meetings:
 - a. Kick-off meeting: Introduce and define process. Establish drawing format, zoning, sequencing, and milestones schedule dates.
 - b. Progress meetings as needed to complete the work but not less than every 2 weeks during coordination.
 - c. Require each trade contractor's coordination representative to physically attend the meetings.
 - d. Invite Architect, Engineer, and Owner's Representative to each meeting.
 - e. Provide meeting minutes within 5 business day of each meeting.
3. Sequencing: Coordinate the addition of information from each trade in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
4. Conflict resolution: Resolve drawing conflicts between meetings. Review major conflicts at the meeting with the Architect / Engineer for resolution. Provide the Architect / Engineer with necessary information to review.
5. Field Coordination: Use approved coordination drawing during installation. When new conflicts are determined, review with coordination team, Architect / Engineer, and Owner's Representative for resolution.

E. Submittal requirements

1. Submit the following:
 - a. Coordination drawings that the contractor has signed-off as being complete. Drawings shall be at a legible scale and include:
 - 1) Composite view of all systems.
 - 2) Isolated view of each individual system.
 - b. Record drawings showing actual built conditions and service configurations.
2. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
3. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."
4. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

- a. File Preparation Format: DWG, DXF, or DGN.
- b. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format and Portable Data File (PDF) format.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Submittals Schedule.

1.2 SUBMITTALS

- A. Submittals Schedule: Submit one copy of schedule. Arrange the following information in a tabular format in chronological order:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's final release or approval.
- B. Contractor's Construction Schedule: Submit one printed copy of initial schedule, large enough to show entire schedule for entire construction period.

1.3 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Submit concurrently with the first complete submittal of Contractor's Construction Schedule. Comply with requirements of individual specification sections.
- B. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice of Award to date of Substantial Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - a.
 - 2. Submittal Review Time: Include review and re-submittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 - 3. Startup and Testing Time: Include not less than business days for startup and testing.
 - 4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work Restrictions: Show the effect on the schedule of the following:
 - a. Limitations of continued occupancies.
 - b. Uninterruptible services.
 - c. Use of premises restrictions.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to the following:
 - 1. Notice to Proceed.
 - 2. State of Michigan Bureau of Fire Services (BFS) milestones:
 - a. Submission of "Application for Fire Safety Plan Examination" and associated fee for fire alarm and fire suppression work.
 - b. Submission of OFS 12A and associated fee.
 - c. BFS 50% inspection.
 - d. Final fire alarm test.
 - e. BFS final inspection.
 - 3. Delivery of major equipment.
 - 4. Substantial Completion.
 - 5. Final Completion.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice of Award. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities
 - 1. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Owner and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Standard General Conditions, Supplemental General Conditions, Division 01 Specification Sections, and other applicable Specification Sections, apply to this Section.
- B. Related sections:
 - 1. Division 01 Section "Construction Progress Documentation" for submitting submittal and construction schedules.
 - 2. Division 01 Section "Special Procedures for Fire Marshal Review and Inspection" for submittal requirements for Fire Marshal review.
 - 3. Division 01 Section "Project Commissioning" for commissioning submittals.
 - 4. Division 01 Section "Operation and Maintenance Manuals" for submitting operation and maintenance manuals.

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. 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. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- B. 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 10 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Resubmittal Review: Allow 10 business days for review of each resubmittal.
- C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier (UM project number) and Specification Section number followed by a brief description. Resubmittals shall include a decimal point, followed by a sequential number. Example file names:
 - 1) PXXXX 081700 Door hardware schedule.pdf; PXXXX 081700 Door hardware schedule.2.pdf
 - 2) PXXXX 238236 Finned Tube Cover product data.pdf
 - b. Coordinate project specific file naming with Architect prior to first submittal.
 3. Transmittal Form for Electronic Submittals: Use electronic form, containing the following information:
 - a. Project name and Owner's Project Number.
 - b. Date.
 - c. Architect name and address.
 - d. Contractor name, address and telephone number.
 - e. Name of firm or entity that prepared submittal.
 - f. Names of subcontractor, manufacturer, and supplier.
 - g. Specification Section number and title or Drawing sheet number.
 - h. Description of items included:
 - 1) Brief written description of each item.
 - 2) Indication of full or partial submittal.
 - 3) Action requested (eg. "for review", "for information only", or other notation).
 - 4) Location(s) where product is to be installed, as appropriate.
- D. Options: Identify options requiring selection by Architect.
- E. Deviations and Additional Information: Clearly note on submittals all deviations from Contract Documents. Do not proceed with work related to the submittal, regardless of Architect/Engineer's action marking, without the Architect/Engineer's specific, written approval of such deviation. Refer to Standard General Conditions for additional requirements and obligations related shop drawings.
- F. Resubmittals: Resubmit in same form as initial submittal.

1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- G. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, commissioning agent, Owner and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- H. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Management of submittal exchange to be coordinated between design and construction teams at start of construction. Potential methods include:
 - a. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
 - b. Web-based file transfer site: Prepare submittals as PDF package, and upload to transfer site, sending notifications of upload via email. Include PDF transmittal form. Include information in email subject line indicating project and submittal specifics.
 - c. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line indicating project and submittal specifics.
 - d. Physical samples:
 - 1) Deliver physical samples to Architect.
 - 2) Submit PDF documentation of physical samples, including transmittal and images of physical samples.
- B. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
- C. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
- D. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings in electronic files formatted for printing to scale on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
- E. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. Provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

4. 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.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected.
 - a. Number of Samples: Comply with requirement of individual specification. Unless noted otherwise, submit three sets of Samples. Architect will retain **one** Sample set; FIC will retain one sample set; remainder will be returned.
 - 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.
- F. Product Schedule: 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.
- G. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

- H. 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.
- I. 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.
- J. 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.
- K. Product / Material Certificates: Submit written statements on manufacturer's letterhead certifying that product / material complies with requirements in the Contract Documents.
- L. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- M. 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.
- N. 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.
- O. 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.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures"
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 DELIVERY OF SAMPLES

- A. Hand deliver all required physical submittals / samples to AEC offices or project site. Location to be coordinated with Owner's Representative at pre-construction meeting.

AEC
Facilities Services Building A
326 E. Hoover, Mail Stop B
University of Michigan
Ann Arbor, Michigan 48109

3.3 ARCHITECT'S ACTION

- A. Architect's/Engineer's Action: Where action and return is required or requested, Architect/Engineer will review each submittal, mark with "Action", and whenever possible return within 2 weeks of receipt.
 - 1. Final Unrestricted Release: Work may proceed, provided it complies with contract documents.
 - a. Marking: "Approved"
 - 2. Final But Restricted Release: Work may proceed, provided it complies with notations and corrections on submittals and with contract documents.
 - a. Marking: "Approved as Noted, Resubmission Not Required"

3. Partial Release: Work may proceed on the indicated portions of the submitted item(s), provided it complies with contract documents. Do not proceed with work on items noted to be resubmitted.
 - a. Marking: "Partial Approval, Resubmit as Noted."
 4. Returned for Re-submittal: Do not proceed with work. Revise submittal in accordance with notations and resubmit without delay to obtain a different action marking.
 - a. Marking: "Not Approved, Revise and Resubmit"
 5. Returning sample or information: Submittals which were for information only and require no action.
 - a. Marking: "Returning Samples / Information"
 6. Submittals Not Requiring Action: Submittals which require no action, such as cleaning and maintenance information; or submittals not required and not reviewed, will be acknowledged as follows:
 - a. Marking: "Action Not Required"
- B. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- C. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

SECTION 013500 - SPECIAL PROCEDURES FOR FIRE MARSHAL REVIEW AND INSPECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes special procedures for Fire Marshal review and inspection for construction projects in University of Michigan buildings under the following jurisdiction:
 - 1. State of Michigan Bureau of Fire Services (BFS).
 - 2. University of Michigan Health Environment Health and Safety department, Fire Safety division.
 - 3. State of Michigan Bureau of Fire Services (BFS) for fire alarm and fire suppression work only.

1.2 RELATED DOCUMENTS

- A. Schedule milestones for BFS project are included in Division 01 section "Construction Progress Documentation".

1.3 SUBMITTALS

- A. Projects including fire alarm and fire suppression scope require submission of the following documents to the State of Michigan BFS. Copies shall be submitted to UM concurrent with submission to BFS:
 - 1. "Application for Fire Safety Plan Examination" for fire alarm and fire suppression work with all supporting documentation and copy of associated fee payment.
 - 2. Signed OFS 12 A with copy of fee payment.
- B. Copies of all inspection reports.
- C. Final inspection manual as detailed in article 2.1:
 - 1. Draft copy: Submit draft copy to UM Owner's Representative for review concurrent with request for inspection, typically at least four weeks prior to final inspection.
 - 2. Inspection copy: Provide one copy to the Fire Marshal at the final inspection.
 - 3. Final copy: Submit two copies to UM Owner's Representative after final inspection is complete.

1.4 COORDINATION

- A. Coordinate scheduling and timing of required administrative procedures, system testing, and inspections with other construction activities to avoid conflicts and to ensure orderly progress of work and inspections.

PART 2 - PRODUCTS

2.1 FINAL INSPECTION MANUAL

- A. General: The final inspection manual shall provide the Fire Marshal with information needed to conduct a final inspection.
- B. Contents:
 - 1. Contents of the inspection manual are specific to each project [and include those items noted on the BFS "Plan Review Report"].
 - 2. Typical contents include but are not limited to the following:
 - a. Details for each through-penetration firestop system from a qualified testing and inspecting agency.
 - b. Notarized affidavits of Compliance for all non-labeled interior finish materials attesting to compliance with the specified flame spread and smoke developed ratings. Affidavits shall state:
 - 1) Name of product.
 - 2) Indication that product has been tested by a nationally recognized independent testing laboratory.
 - 3) Name of testing laboratory.
 - 4) Laboratory project or test number.
 - 5) Date of test.
 - 6) Test results.
 - 7) Statement that product was installed as tested.
 - c. Construction inspection approval certificates for mechanical and electrical construction.
 - d. Light level calculations for required emergency lighting.
 - e. Final fire alarm approval certificate.
- C. Format:
 - 1. Manuals shall be three hole punched and bound.
 - 2. Provide heavy paper dividers with plastic tabs to divide the Manual into sections.
 - 3. Provide a Table of Contents at the front of the Manual. List each tabbed section of the Manual.

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 013500

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed." No such implied meaning will be interpreted to extend Architect/Engineer's responsibility into Contractor's area of construction supervision.
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Or equal": When the phrase "or equal" is used after a single manufacturer's name, or at the end of a list of manufacturer's names, submit proposed products in strict compliance with the "Owner's Options" clauses of the Standard General Conditions.
 - 1. The Owner will consider only those Contractor-proposed substitutions submitted with the Bid in the "Owner's Options" portion of the Form of Proposal.
 - 2. In all cases, judgments of equality of products will be made solely by the Architect/Engineer.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States" and as follows:

1. "AFF": "Above finished floor" level
2. "Mfr"/"Mfr's": "manufacturer" / "manufacturer's"
3. "NIC": "Not in Contract"
4. "OFCI": "Owner furnished, Contractor installed"
5. "w/": "with"

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes temporary plumbing and electrical services and provisions for protecting personnel and property.
- B. Related Work of other Sections:
 - 1. Division 01 Section "Temporary Tree and Plant Protection".

1.2 QUALITY ASSURANCE

- A. Standards and Regulations: Comply with applicable laws and regulations and the following:
 - 1. NFPA Code 241, "Building Construction and Demolition Operations".
 - 2. ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition".
 - 3. NECA Electrical Design Library "Temporary Electrical Facilities".
- B. Conditions of Use: Keep facilities clean and neat. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.1 ELEVATOR USE AND PROTECTION

- A. Existing Elevator Use:
 - 1. Use of designated Owner's existing elevator will be permitted, provided elevator is protected, cleaned and maintained daily in a condition acceptable to Owner's Representative.
 - 2. Elevator will be dedicated to contractor use.
 - 3. Elevator will be shared with other users. Coordinate use with Owner's Representative and provide priority to U-M use.
- B. Documentation: Before beginning work, document the condition of the car entries, interior, and controls by photographs. Submit all documentation to Owner's Representative.
- C. Protection
 - 1. Do not exceed 25% of elevator load capacity with any one piece of material, equipment, or hand truck. Do not exceed elevator load capacity. Coordinate and schedule heavy usage with Owner's Representative prior to loading.
 - 2. Provide removable protective coverings (pads), barriers, devices, signs, or other procedures to protect elevator car (wall and ceilings) and entrance doors and frame.

- a. All materials shall be class A and have a label permanently affixed to the pad. Labels shall be visible when materials are installed.
 - b. Submit weight of materials to Owner's Representative.
 - c. Obtain existing removable wall pads from the Owner and install for the duration of the project. Return at completion of work. Replace all pads damaged during construction.
- 3. Maintain access to the emergency phone, main car operating panel, and emergency escape hatch inside the elevator.
- D. Substantial completion
 - 1. At Substantial Completion, restore elevator to condition existing before initial use
 - 2. If, elevators were damaged during work, engage certified Elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
 - a. Correct any damage to car interior, controls, sills, and entrance doors and frame, and restore elevator to condition existing before initial use.

2.2 CONSTRUCTION FENCE

- A. Fabricate construction fence of minimum 36-inch tall factory-wired wood slat "snow fence" with water-resistant treated wood support stakes at 48-inches on center.
- B. Fabricate construction fence of the following materials:
 - 1. Wire Mesh Fabric: 9 gage galvanized steel wires, woven into 2-inch diamond mesh pattern with top selvages knuckled.
 - 2. Posts: As required for indicated height, but not less than 2.37 outside diameter.
 - 3. Fence post base plates: As required for indicated height.
 - 4. Gate Frames: 1.90-inch outside diameter. Fabricate gates with 7 gage diagonal tension wires for units wider than 36 inches.
 - 5. Rails: Not less than 1.66-inch outside diameter.
 - 6. Hardware: Provide galvanized steel connectors, gate hinges and hasps as recommended by manufacturer.
 - 7. Screening Material: 85% closed knitted polyethylene screen fabric; 5.1 oz. per sq. yd.; grommets spaced 24 inches on center along cloth perimeter for attachment to wire mesh and posts.
 - a. Product: Midwest Cover Inc., Construction 85, Color: Navy.

2.3 ROOF PROTECTION

- A. Roofing Protection: Provide protective measures for areas on existing roof used for construction access, where materials are being moved or stored.
- B. Provide 1 1/2" ISO insulation with 3/4" plywood over ISO at all areas of work and foot traffic. Plywood is to be tied together.

- C. Prevent debris from entering the roof drains by placing filter fabric over the drains. When cleaning is complete remove the filter fabric and properly dispose of collected debris.

PART 3 - EXECUTION

3.1 PERFORMANCE

- A. Barriers: In general, provide barriers between active construction operations and completed areas of work, and between construction activity and Owner occupied areas. Provide barriers in locations indicated on drawings, or if not indicated, as required by Owner's Representative.
 - 1. Construct barriers of metal or fire-retardant treated wood studs and 6 mil thick plastic sheet.
 - 2. Construct construction barriers serving as separation between active construction areas and occupied areas to provide 1-hour fire-rated assembly as defined by Underwriters Laboratory "Fire-Resistance Directory."
 - 3. Provide dust covers over Owner's equipment and furnishings. Use 6 mil thick clear plastic sheet and thoroughly tape seams to provide dust-proof cover.

3.2 TEMPORARY UTILITY INSTALLATION

- A. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electrical service. Install service in compliance with National Electrical Code (NFPA 70). Provide outlets and lighting as required for operations. Comply with applicable provisions of Division-26.
 - 1. Owner will pay for reasonable use of electricity related to the Work.
- B. Water Service: Connect to existing building services. Comply with applicable provisions of Division-22.
 - 1. Owner will pay for reasonable use of water related to the Work.

3.3 PROTECTIONS

- A. Openings Between Floors: Shaft and chase spaces may terminate above occupied areas within building. Existing barriers between floors are not designed to prevent debris from falling through to bottom level. Provide appropriate barriers at all unprotected openings between floors during construction operations.
 - 1. Protect openings between floors with appropriate materials, providing full coverage of opening in a manner which will prevent personnel, equipment, construction materials and debris, from falling through; capable of withstanding loads imposed during construction operations; and secured to prevent unintentional removal.

- B. Roofing Protection: Provide protective measures for areas on existing roof and around curbed openings during installation of fans or other roof mounted units and areas where materials are being moved or stored.
- C. Construction Fence Erection: Drive support stakes into ground not more than 48-inches on center and to sufficient depth to provide support for fencing. Wire pre-fabricated fencing material to stakes.
- D. Construction Fence Erection: Provide fence panels with posts and post base-plates. Do not drive posts into ground, concrete walks or pavement.
 - 1. Fence Panels: 6'-0" high X 12'-0" long max.
 - 2. Provide hasp and pad lock at each gate.
 - 3. Secure wire mesh to outside face of posts with 9 ga. galvanized metal wire ties spaced not less than 16 inches on center. Install mesh to align with top of posts.
 - 4. Secure fabric screen to outside face of construction fence using 9 gage galvanized steel wire. Fasten fabric sheets at 18-inches o.c. through grommets to top rail, each line and corner post, and at bottom to wire mesh.
- E. Construction Fence Erection: Drive line and corner posts into ground not less than 42 inches below grade, with not less than indicated dimension exposed above grade, and spaced not more than 18 (may use 12 feet if no top rails) feet on center. Erect top rails and gates where indicated.
 - 1. Height of Fence Exposed Above Grade: 8 feet.
 - 2. Height of Fence Exposed Above Grade: 10 feet.
 - 3. Provide hasp and pad lock at each gate.
 - 4. Secure wire mesh to outside face of posts with 9 ga. galvanized metal wire ties spaced not less than 16 inches on center. Install mesh to align with top of posts.
 - 5. Secure fabric screen to outside face of construction fence using 9 gage galvanized steel wire. Fasten fabric sheets at 24-inches o.c. through grommets to top rail, each line and corner post, and at bottom to wire mesh.

3.4 CONCRETE AND GROUT WASHOUT

- A. Do Not Discharge concrete/grout washout into storm drains, catch basins, the sanitary sewer system, ditches, or surface waters. Perform washing of concrete trucks and materials clean-up in designated areas or an approved off site location. Use as little water as necessary.
- B. Designated pit areas should be clearly posted. All pits should be lined to prevent seepage. If not lined, the bottom of the pit should be at least 5 feet above the water table. Locate designated areas a minimum of 50 feet from storm drains, bodies of water, and ditches.

- C. Alternative to a designated pit area: Prove an appropriate washout container. Inspection of these wash out containers should occur regularly, to ensure no liquids are draining from the box to storm drains, catch basins, the sanitary sewer systems, ditches, or surface waters. Be aware of forecasted rain events and plan to empty containment systems ahead of time to provide enough storage, or cover to prevent overflow.
- D. Once concrete washout has hardened, dispose of properly. Disposal of hardened concrete/grout should occur on a regular basis.
- E. Washout areas must be cleaned when 75% full. Provide additional locations as needed.
- F. For additional information, review the Concrete Washout Water and Slurry Guideline: <https://EHS.UMICH.EDU/WP-CONTENT/UPLOADS/2021/02/CONCRETE-WASHOUT-WATER-AND-SLURRY.PDF> or CONTACT EHS - EPPP AT 734-647-1143.

END OF SECTION 015000

SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide all equipment and materials, and do all work necessary to protect existing trees and plants from damage as a result of the Contractor's operations.

1.2 SUBMITTALS

- A. Proposed methods, materials to be employed and schedule for effecting tree and plant protection shall be submitted for approval, including tree protection fence.

1.3 SPECIAL SITE LIMITATIONS

- A. Areas around trees that could be impacted by construction activities before such activity begins are identified on the Drawings as "Protective Zones/Protected Areas". Protective zones around each tree shall be clearly identified on contract documents. The protective zone shall not encroach on the canopy dripline unless there is a compelling reason why this is not practical. In such a situation, approval for the deviation must be obtained from the Owner's Representative.
- B. Protected areas shall not be entered or used for any purpose during construction except as authorized by the University Forester (UF). Areas identified on the Drawings as "Temporary Work Zones" within the Protected Areas are zones in which construction shall be undertaken, but only after the UF has been notified of the intended operations in the Temporary Work Zone. The UF shall be notified at least 48 hours prior to work scheduled in the Temporary Work Zone. Depending on field conditions, the UF may require additional tree protection consisting of fencing and boxing to protect tree trunks and roots.
- C. Plans for all operations within Temporary Work Zones shall be reviewed fully with the UF before beginning work. Contractor shall plan operations in Temporary Work Zones to minimize the use of wheeled, motorized equipment, and to minimize root compaction and root disturbance. All excavation in Temporary Work Zones shall be initiated with root pruning trenching as specified herein. All excavation in Temporary Work Zones shall be scheduled to minimize the amount of time between excavation and completion of the construction item in the Temporary Work Zone. Schedule shall be approved by the Owner's Representative. After each work item is completed in the Temporary Work Zone, the protection fence shall be restored to its original position to reestablish the protected area.

PART 2 - PRODUCTS

2.1 TREE/LANDSCAPE PROTECTION FENCING

- A. Tree and landscape protected area fencing shall be:
 - 1. Wire Mesh Fabric: Six foot 9 gage galvanized steel wires, woven into 2-inch diamond mesh pattern with top selvages knuckled.
 - 2. Posts: As required for indicated height, but not less than 2.37 outside diameter.
 - 3. Rails: Not less than 1.66-inch outside diameter. Rails are not typically required unless a bottom rail is required for areas adjacent to walks to meet accessibility requirements.
- B. Fencing other than that specified above will be subject to the approval of the UF, or as specifically noted on the plans.

2.2 BOXING

- A. Boxing shall be installed for trees that are in jeopardy of damage in the Temporary Work Zone and identified for boxing by the UF. Size of box enclosure for each tree will be determined in the field by the University Forester.
- B. Boxing shall be 4 x 4 inch wood posts spaced 8 feet on center with three, 2 x 4 inch wood rails between posts to a height of approximately 5 feet.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION MEETING

- A. Contractor shall schedule a tree and plant protection pre-installation site meeting with the Owner's Representative and UF and/or qualified U-M Grounds personnel prior to the start of site construction, which includes prior to installation of construction fence and tree and plant protection.

3.2 INSTALLATION OF FENCING

- A. Prior to start of demolition work and clearing and grubbing operations, tree and planting protection fencing shall be installed in accordance with the following:
 - 1. At tree protection areas indicated on Drawings and as staked in the field.
 - 2. At locations indicated on the Drawings as "Protected Areas."
- B. The protective zone will be extended at a minimum out to the tree's dripline and is better defined as the "critical root zone" (CRZ). CRZ is determined by measuring a radius from the tree's trunk that is equal to 1 foot for each inch of tree diameter.

- C. Tree and Landscape "Protected Area" temporary fence erection: Drive line and corner posts into ground not less than 42 inches below grade, with not less than indicated dimension exposed above grade, and spaced not more than 18 feet on center (may use 12 feet if no top rails). Erect bottom rails where needed to meet ADA requirements.
1. Height of Fence Exposed Above Grade: 6 feet.
 2. Secure wire mesh to outside face of posts with 9 gage galvanized metal wire ties spaced not less than 16 inches on center. Install mesh to align with top of posts.

3.3 ROOT PRUNING

- A. Where excavation will be in close proximity to existing trees designated to remain, roots shall be pruned by University Forester or as otherwise specified by the Owner's Representative after consulting with the University Forester. Contact Owner's Representative when roots are exposed. Root pruning shall be as indicated on the drawings and as additionally identified in the field by the Owner's Representative. Root pruning shall consist of cutting clean, straight excavation through upper root zone, 12 inches to 18 inches deep, wherein all roots shall be cut cleanly and flush with face of excavation thus causing minimum amount of disturbance to remaining roots. Use of motorized ditch-digging machine for this purpose is permitted. Use of other motorized excavation equipment, which causes excessive root movement, dislodgment, ripping, or splintering will not be permitted. In this situation, UF and/or U-M arborists may use an Air Spade (compressed air soil excavator) to clear soil from root zone to route utilities under the root system without cutting roots.
- B. Coordinate with Owner's Representative to provide aeration and slow release tree watering bags as remediation measures for trees that have been negatively impacted by construction.

3.4 REMOVAL OF PROTECTION

- A. Except as otherwise indicated or requested by Project Manager after consulting with the UF, temporary protection devices and facilities installed during course of the work shall be removed only after all work that may injure or damage trees and plants is completed.

END OF SECTION 015639

SECTION 015719 - CONSTRUCTION AIR QUALITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Standard General Conditions, Supplemental General Conditions, Division 01 Specification Sections, and other applicable Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Division 23 Section: Custom Air Handling Units.
 - 2. Division 23 Section: Semi-Custom Air Handling Units.
 - 3. Division 23 Section: Air Filters.
 - 4. Division 23 Section: HVAC Ducts and Casings.
 - 5. Division 23 Section: Air Duct Accessories and RGD's.

1.2 SUMMARY

- 1. This Section includes requirements for construction air quality including diesel exhaust mitigation.
- 2. These requirements are also applicable to LEED 2009 IEQ credit 3.1 Construction Indoor Air Quality Management Plan - During Construction.

1.3 QUALITY ASSURANCE

- A. Indoor Air Quality Reports: Review periodic Indoor Air Quality Reports provided by others and promptly comply with report recommendations.
- B. Inspection and Maintenance: Periodically inspect project conditions to assure that indoor air quality measures are being implemented. Maintain indoor air quality measures to assure operational effectiveness.

PART 2 - PRODUCTS

2.1 AIR FILTRATION

- A. Provide air filters or filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 or as specified, whichever is greater.

PART 3 - EXECUTION

3.1 HVAC SYSTEM PROTECTION

- A. Protect HVAC systems per Related Sections.
- B. Ductwork Contamination: Provide professional cleaning for all ductwork contaminated with construction debris and dust.

3.2 SOURCE/POLLUTION CONTROL

- A. Temporary Heat and Hazardous Exhaust: Provide temporary heaters that exhaust combustion air directly to the outside of the building, or that prevents hazardous exhaust levels within the construction area. Limit the use of exhaust producing equipment inside the construction area.
- B. Assure exhaust fumes are not drawn into new and existing air intakes.
- C. Volatile Organic Compounds (VOC) control: Limit the buildup of VOCs within the construction area by storing VOCs in tight containers, providing ventilation with outside air during installation of VOC emitting material. Locate pollutant sources in one designated area away from supply ducts, areas occupied by workers, and absorbent materials.
- D. Smoking is prohibited in all University of Michigan buildings and grounds.

3.3 PATHWAY INTERRUPTION

- A. Construction partitions: Provide air tight temporary construction partitions to separate occupied or completed areas from active construction areas.
- B. Construction area pressurization: Provide temporary fans or portions of the permanent air handling system to maintain a negative pressure in the construction areas relative to adjacent occupied or completed spaces.
- C. Provide construction entry mats at each entry to limit dirt and debris from entering the building.

3.4 HOUSEKEEPING

- A. Perform daily housekeeping to prevent the accumulation and tracking of debris, dirt, dust, and moisture within the construction area. Coordinate activities of the various trades to organize work areas to assure that routine cleaning is effective.
- B. Provide thorough cleaning of all building interior surfaces prior to HVAC filter replacement, testing and balancing, and commissioning activities.

3.5 SCHEDULING

- A. Schedule high pollution activities that utilize high VOC level products such as paints, sealants, adhesives, caulking and cleaners to take place prior to installing highly absorbent materials such as ceiling tiles, carpet, fabric furniture, acoustic panels, insulation, and gypsum board.
- B. Where practical, perform high VOC work during off-hours to minimize personnel exposure.
- C. Coordinate schedule for installation of low-VOC products with temperature requirements.
- D. Schedule delivery to minimize storage requirements of materials on the project site.

1. Where air testing or building flush-out procedures are required, provide adequate time to conduct these activities prior to building occupancy.

3.6 DIESEL EXHAUST MITIGATION

- A. All diesel equipment utilized on the project site except delivery trucks shall be fueled with biodiesel B-20. In case of extreme cold weather, biodiesel B-5 is acceptable. Provide records of refueling receipts when requested by the owner.
- B. All diesel equipment utilized on the project for more than ten workdays shall utilize exhaust after-treatment devices to reduce emission from diesel engines. Exhaust after treatment devices shall be either diesel oxidation catalyst type or diesel particulate filters. The required minimum percent reduction in emissions for either device shall be, PM: 20%, HC: 40%, CO: 10%.

END OF SECTION 015719

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the product delivery, storage and handling and Contractor's selection of products for use in the Project.

1.2 QUALITY ASSURANCE

- A. Compatibility of Options: When Contractor is given the option of selecting between two 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.

1.3 PRODUCT DELIVERY STORAGE AND HANDLING

- A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.
 - 1. Schedule delivery to minimize storage time at site and to avoid overcrowding of construction area.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
 - 3. Deliver products to the site 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 that products are undamaged and properly protected.
 - 5. Store heavy materials away from the project structure in a manner that will not endanger the supporting construction.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

- A. General Product Requirements: Provide products that are undamaged and, unless otherwise indicated, unused at the time of installation.
 - 1. Provide products complete with accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
- B. Product Selection Procedures: No substitutions will be permitted, except those in compliance with the Contract Document provisions concerning "Owner's Options"; otherwise comply with the following:
 - 1. Proprietary Specification Requirements: Where a single product or manufacturer is named, provide only the product indicated.

2. Semi-proprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated.
 - a. Where products or manufacturers are specified by name, accompanied by the term "or equal", or "or approved equal" comply with the Contract Document provisions concerning "Owner's Options."
3. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide only a product or assembly possessing the specified characteristics and that otherwise complies with Contract requirements.
4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with indicated requirements, and are recommended by the manufacturer for the application indicated.
5. Compliance with Standards, Codes and Regulations: Where Specifications only require compliance with a code, standard or regulation, select a product that complies with the indicated standards, codes and regulations.
6. Visual Matching: Where Specifications require matching an established sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Installation of the Work.
 - 2. Protection of installed construction.
- B. Related Requirements:
 - 1. Section 011000 "Summary" and 011400 "Work Restrictions" for limits on use of Project site.
 - 2. Section 017329 "Cutting and Patching"
 - 3. Section 017700 "Closeout Procedures" for final cleaning.
 - 4. Section 019100 "Project Commissioning" for start-up.
 - 5. Section 024119 "Selective Demolition" for demolition.
 - 6. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine rough-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

- B. Correct defects that would result in unacceptable performance of materials or equipment to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information

3.3 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Install Work within recognized industry tolerances, if not otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

- G. Attachment: Provide blocking and attachment plates, anchors, fasteners, and other devices of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Allow for building movement, including thermal expansion and contraction.
 - 2. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Mounting Heights: Except as otherwise indicated, mount individual units of Work at industry recognized standard mounting heights for applications indicated. The Contractor shall refer questionable mounting height choices to the Architect/Engineer and the Owner for final decision. The Contractor shall comply with the Owner's and the State of Michigan's requirements for accessible mounting heights.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Adjust, clean, lubricate, restore marred finishes and protect installed Work to ensure that it will remain without damage or deterioration during the remainder of the construction period. Unless otherwise specified by the Contract Documents, all Work is to be thoroughly cleaned prior to its being turned over to the Owner. This includes dusting, window cleaning, floor cleaning and all other operations associated with the proper cleaning of the Work. Waxing or buffing floors shall be performed when required by the Contract Documents.

3.4 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work (completed or in progress) is without damage or deterioration at time of Substantial Completion. Comply with manufacturer's written instructions.

END OF SECTION 017300

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Extent of cutting and patching work is generally not specifically shown on drawings. Include cutting and patching work as indicated by provisions of this Section.
 - 1. Cut holes and openings in, or remove portions of, existing construction necessary for connection of new architectural elements, mechanical and electrical utilities and services, equipment and supports.
 - 2. Patch around mechanical and electrical penetrations.
 - 3. Patch floors, walls, and ceilings damaged by demolition operations, including removal of indicated mechanical and electrical items, and indicated wall-, floor-, and ceiling-mounted items. Patch and paint openings in walls, floors and ceilings created by demolition and removal operations.
 - 4. Patch and repair blemishes and holes in existing construction surfaces left in place, and scheduled to be exposed, that have been damaged due to construction operations.
- B. Materials removed and not indicated to be turned over to Owner or indicated for reuse, as well as rubble and debris resulting from these operations, are property of Contractor.
- C. Related requirements:
 - 1. General: Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the work.
 - 2. Division 2 sections for selective demolition, regulated construction waste, asbestos, lead and PCB remediation.
 - 3. Division 21, 22, 23 and Division 26, 27 and 28 sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.2 DEFINITIONS

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

1.3 SUBMITTALS

- A. Product data indicating compliance with requirements for the following finish materials used in patching:
 - 1. Acoustical tile.
 - 2. Resilient flooring.
 - 3. Rubber base.
- B. Samples for initial selection for the following:
 - 1. Acoustical tile.

2. Resilient flooring.
 3. Rubber base.
- C. Qualification data for firm engaged to perform cutting and patching of roofing system.

1.4 QUALITY ASSURANCE

- A. Assignment of Cutting and Patching Responsibilities:
1. Cutting shall be the work of the individual architectural, mechanical or electrical trade requiring such cutting for access, or to permit alteration to be performed, or similar purposes.
 - a. Cutting required for inspection and to obtain test samples shall be the work of the General Contractor.
 2. Patching shall be the work of the appropriate architectural trade.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
1. Roofing Elements:
 - a. Standards: Perform cutting and patching work in compliance with University of Michigan Facilities and Operations standards (phone 647-2059 for information on requirements), and with recommendations of the National Roofing Contractor's Association "Roofing and Waterproofing Manual".
 - b. Installer Qualifications: Arrange for cutting and patching of roofing systems by firm experienced in similar work, and licensed by manufacturer of roofing system to perform required repair work.
 - c. Pre-Construction Conference: Arrange and attend meeting with Owner's Representative, representative of Owner's roofing maintenance department, and representative of roofing firm to determine procedures for cutting and patching roofing system.
 2. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 3. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 4. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

5. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials for Patching: Unless otherwise indicated, use materials for patching identical to existing materials. If identical materials are not available, or cannot be used, use materials visually matching existing adjacent surfaces to the fullest extent possible and that result in equal-or-better performance characteristics.
- B. Asphalt Patching: Provide 8-inch thick 21 AA limestone base, 2-inch No. 1300 leveling course, and 2-inch No. 1300 wearing course in accordance with MDOT 1984 Standard Specifications for Construction.

PART 3 - EXECUTION

3.1 PERFORMANCE

- A. Protect existing property, equipment, remaining surfaces, utilities and services within and adjacent to work from damage due to operations. If utilities or services are uncovered that are not indicated on drawings, advise Owner and do not work in immediate area until instructed by Owner.
 1. Shore and brace existing construction during cutting operations as required to prevent cracking, movement, or collapse of existing assemblies, surfaces and materials.
- B. Use extreme caution when cutting into shafts and chases. Shafts and chases may end above occupied areas within building. Take all necessary precautions to prevent debris from falling into shaft during cutting and patching operations. Comply with requirements of Division 01 Section "Temporary Facilities and Controls".
- C. Before cutting and patching the following building elements, obtain the Owner's Representative's approval to proceed:
 1. Structural concrete.
 2. Roofing materials.
 3. Miscellaneous structural metals, including lintels and equipment supports.

- D. Cutting Concrete Floors: Before core drilling, saw-cutting, or breaking up concrete floors, test for the presence of electrical conduits. Use an impulse induction type scanner, similar to Hilti Ferroskan, capable of detecting both metallic conduits and copper wires in PVC conduits. Tracers that scan for energized cables or that scan for injected high frequency signals are not acceptable. Immediately restore, at no cost to the Owner, conduits damaged during cutting operations. Comply with the following notification requirements:
1. Notify the Owner's Representative not less than 72 hours in advance of each core drilling operation. Owner's Representative will arrange notification of building occupants of potential for power outage.
 2. Notify the Owner's Inspection Department prior to conducting each test.
- E. Patching: Match existing construction. Comply with applicable materials and workmanship requirements of individual sections of these Specifications that govern new work.
1. Patch exposed-to-view surfaces with seams which are durable and as invisible as possible. Create surface finishes matching existing adjacent surfaces in color, texture, gloss and other visual characteristics.
 2. Patch all partition, floor, ceiling and roof assemblies to maintain original performance characteristics, including those for fire and acoustical barriers.
 - a. Patch fire-rated assemblies using safing materials between the penetrating element and fire-rated assembly. Use safing materials complying with Division 07 Section "Penetration Firestopping" and that will not reduce the fire-rating of the existing assembly.
 - b. Patch assemblies to maintain acoustical barrier performance using joint sealing materials between the penetrating element and assembly. Use latex acoustical sealants complying with Division 07 Section "Joint Sealants."
- F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

END OF SECTION 017329

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. The requirements of this Section are in addition to project closeout requirements indicated in the Standard General Conditions.

1.2 SUBSTANTIAL COMPLETION

- A. Prerequisites to Substantial Completion: Complete the following:
 - 1. Submit statement showing changes to Contract Sum. Advise Owner of pending insurance change-over requirements.

1.3 DEFINITIONS

- A. Discharge to Ground: Discharge to grassy and/or soil areas capable of water infiltration. Frozen ground conditions are not capable of infiltration.
- B. Wash Water: Liquid waste generated during cleaning activities, including mixtures of water and chemicals and/or detergents. It also includes water containing residues of chemicals, detergents, or the substances being removed (i.e., paint, solvents, etc.). It does not include runoff from cleaning with only potable water that has not come into contact with chemicals or detergents.

1.4 FINAL CLEANING

- A. Final Cleaning: Immediately before turning project over to Owner, wash and clean all parts of the Work. Remove tools and equipment, construction debris, rubbish, and surplus materials.
 - 1. Clean interior and exterior surfaces of window units and glass within the limits of construction area, including the following:
 - 2. Clean interior surfaces of window units and glass within the limits of construction area.
 - a. New window units and glass installed under Contract.
 - b. Existing window units and glass repaired under Contract.
 - c. Existing window units and glass not installed or repaired under Contract.
- B. Disposal of Wash Water from Activities Outside Buildings:
 - 1. Protect storm drains and catch basins. Do not allow runoff from cleaning activities that is discharged to ground to leave the site.
 - 2. Utilize one of the following two procedures to handle wash water generated from detergent or chemical cleaning.

- a. Obtain approval from the Michigan Department of Environmental Quality (MDEQ) for contractor to discharge to the ground by "authorization by notification" as a mobile power washer. Do not reference University of Michigan in application.
 - 1) Contact UM Environment, Health and Safety department (EHS) - Environmental Protection & Permitting at 734-936-1920 for information on discharge to ground.
- b. Collect wash water and sample to determine proper disposal method.
 - 1) Contact UM EHS-HazMat at 734-763-4568.
 - 2) Allow adequate lead time for sampling, analysis and disposal coordination.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section defines the Contractor's requirements for providing electronic Operation and Maintenance (O&M) Manuals.
 - 1. Provide O&M information for all materials, equipment, and systems supplied.
 - 2. Contractors installing equipment pre-purchased by the project (AHU's, chillers, substations, generators, etc.) shall provide O&M Manuals for the pre-purchased equipment assigned to them for installation.
 - 3. Contractors installing or relocating equipment furnished by the Users (lab equipment, audio/visual equipment, etc.) need not provide O&M Manuals for User-furnished equipment.

1.2 RELATED DOCUMENTS

- A. Refer to the U-M Standard General Conditions and other Division 01 Specification Sections for requirements which apply to this Section.
- B. Special operation and maintenance data requirements referenced in the other Technical Specification Sections apply to this Section.

1.3 SCHEDULE

- A. Submit a draft O&M Manual for approval soon after construction starts.
- B. Submit, as soon as it is completed and in advance of all training, a copy of the final O&M Manuals for approval.
- C. Provide approved O&M Manuals for Owner use a minimum of two weeks prior to scheduled Owner training.
- D. Submission of approved O&M Manuals is a prerequisite for Substantial Completion and final payment.

1.4 CONTENTS

- A. The O&M Manuals shall provide the Owner's maintenance personnel with the information they need to install, inspect, test, operate, clean, lubricate, maintain, adjust, repair and replace the project's materials, systems and equipment.
- B. The O&M Manuals shall include information on the following:
 - 1. Divisions 02 Through 14: Systems and equipment items include but are not limited to:
 - a. Power operated doors, windows, fire shutters, roof hatches, and related items.
 - b. Operable partitions.
 - c. Electric signs and graphics systems.
 - d. Motorized projection screens and projector lifts.
 - e. Fume hoods, bio-safety cabinets and snorkels.

- f. Laboratory plumbing and electrical fixtures specified as part of laboratory casework.
- g. Laboratory equipment including ventilated cages, sterilizers, glass washers, tunnel washers, cage and rack washers, bedding dispensers/disposers, water bottle fillers, and auto watering systems.
- h. Darkroom equipment.
- i. Motorized shades and blinds.
- j. Dock levelers and truck restraint systems.
- k. Trash compactors
- l. Controlled environment rooms.
- m. Elevators and barrier-free lifts.
- n. Food service equipment.
- o. Roofing
- p. Flooring
- q. Windows
- r. Doors
- s. Skylight systems
- t. Door/window/skylight hardware
- 2. Divisions 21, 22 and 23: Systems and equipment items include but are not limited to:
 - a. Tunnel piping, valves, expansion joints, and loops.
 - b. Building piping, valves, expansion joints, and loops.
 - c. Meters and gauges.
 - d. Heat trace systems.
 - e. Motors, motor controllers, and variable frequency drives.
 - f. Water treatment systems.
 - g. Fire protection systems.
 - h. Piping and plumbing specialties.
 - i. Hot and cold domestic water systems.
 - j. Sanitary and laboratory waste systems.
 - k. Grease interceptors/separators.
 - l. Rainwater and storm sewer systems.
 - m. Irrigation systems.
 - n. Purified and RO/DI water systems.
 - o. Pumps.
 - p. Medical and specialty gas systems.
 - q. Natural gas systems.
 - r. Fuel oil storage and transfer systems.
 - s. Hot water heating systems.
 - t. Boilers.
 - u. Chilled water systems.
 - v. Chillers.
 - w. Cooling towers.
 - x. Condenser water systems.
 - y. Steam and condensate systems.
 - z. Engine-generator exhaust systems.
 - aa. Sand filters.
 - bb. Humidifiers.
 - cc. Heat exchangers.
 - dd. Terminal heating and cooling units.
 - ee. Energy recovery systems.
 - ff. Free cooling systems.
 - gg. Smoke evacuation systems.
 - hh. Stairwell pressurization systems.
 - ii. Point exhaust systems.
 - jj. Laboratory vacuum systems.

- kk. Compressed air systems.
- ll. Control air systems.
- mm. Exhaust air systems.
- nn. HVAC systems.
- oo. Air handling units.
- pp. Fans.
- qq. Pressurization control systems.
- rr. Mechanical systems controls.
- ss. Laboratory and fume hood controls.
- tt. Clean room controls.
- uu. Kitchen Hoods.
- vv. Kitchen exhaust controls.
- ww. Fan coil units.
- xx. DX systems.
- yy. Computer room HVAC systems.
- zz. Saw dust collection systems.
- 3. Divisions 26, 27 and 28: Systems and equipment items include but are not limited to:
 - a. Primary power distribution.
 - b. Unit substations.
 - c. Secondary power distribution and metering.
 - d. Engine-generators, transfer switches and load banks.
 - e. Paralleling switchgear.
 - f. Motor starters and controls.
 - g. Wiring devices.
 - h. Grounding.
 - i. Normal and emergency lighting.
 - j. Lighting control and dimming systems.
 - k. Lighting individual controls.
 - l. Voice & data systems.
 - m. Emergency and campus telephones.
 - n. Audio/visual systems.
 - o. Room scheduler systems.
 - p. Master clocks.
 - q. Access control systems.
 - r. Security and CCTV systems.
 - s. Fire detection and alarm systems.
 - t. Emergency responder radio coverage systems.
 - u. MOSCAD (Motorola SCADA alarm transmitter to DPSS).
- 4. Divisions 31, 32, 33 and similar site/civil:
 - a. Provide O&M information for all materials, equipment, and systems supplied or assigned to install.

1.5 DOCUMENTATION REQUIREMENTS

- A. Provide complete information regarding the installation, inspection, testing, operation, cleaning, lubrication, maintenance, and adjustment of the equipment supplied, including data needed to facilitate maintenance in accordance with the warranty requirements, and data needed to order an exact replacement or the approved spare parts. Manufacturers' sales literature and similar promotional materials shall not be included.

- B. Documentation shall be project specific. Edit manufacturers' standard documentation to reflect the exact equipment supplied. Circle, box out, or draw an arrow toward information that applies. Cross out information that does not apply. Do not highlight information because highlighting cannot be photocopied. Documentation that is not properly marked will be rejected.
- C. Drawings shall not be reduced in size when converted/assembled as a PDF.
- D. When documentation on a system or assembly includes data from more than one manufacturer, provide complete data on each component. Assemble the data into one bookmarked section of the Manual.

1.6 IDENTIFICATION

- A. In the Table of Contents and in each bookmarked section, identify each system and equipment item using the same name designation used in the Contract Documents.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Soon after construction starts, submit a draft O&M Manual for approval. This draft shall indicate the proposed electronic organization of the O&M using named electronic folders, subfolders and preliminary bookmarks.
- B. Throughout the construction process, gather operation and maintenance documentation and enter the data into the electronic folders. As documentation is compiled into the O&M, create electronic bookmarks that make it easy to find information within each PDF. Periodically, and when requested by the Commissioning Authority, submit the O&M for review of the folder arrangement and bookmarks.

3.2 GENERAL FORMAT REQUIREMENTS

- A. The electronic O&M information shall be provided as Adobe Acrobat PDFs stored in a folder structure. The folder structure shall serve as the Table of Contents for the O&M. All words (characters) in PDFs shall be searchable, including those in images, wiring diagrams, exploded views, etc. Provide information from manufactures that is word/character searchable; only when not available, scan documents using Optical Character Recognition (OCR) software. Assemble the documentation so that the reading orientation is the same throughout the O&M manual. When viewed electronically, it shall not be necessary to "rotate" pages in order to read the predominant text orientation on a page in a horizontal manner.

- B. The folder name format for the over-all Manual shall be PXXXXX O&M DRAFT YY-MM-DD.pdf, where XXXXX is the last 5 digits of the U-M project number and YY-MM-DD is the date the draft version is submitted (arrange date as indicated). Subsequent drafts shall have the same file name except with an updated date in the file name. Revise the word DRAFT to FINAL upon final approval of the Manual.
- C. The folder structure of the electronic O&M shall be divided by major trade, i.e. Architectural, Mechanical and Electrical.
- D. The file name of any O&M file and the total of the folder path names to that file shall not exceed 250 characters (including spaces). This is required to allow importation of the information into the Owner's digital archive (by the Owner after the final O&M is accepted). Keep folder and file names short to avoid exceeding the character limit.

3.3 TABLE OF CONTENTS AND ARRANGEMENT

- A. The table of contents shall consist of electronic folders and subfolders arranged and labeled in a logical and intuitive manner. Arrange and label the folders and subfolders per the Sample Table of Contents (TOC) shown at the end of this specification.
 - 1. The **highest level** of the folder structure shall be O&M manual name, named per the naming convention described in Article 3.2 above.
 - 2. The **second highest level** of the folder structure shall be by major trade, i.e. Architectural, Mechanical and Electrical.
 - 3. The **third highest level** shall be the O&M information provide for each trade (Architectural, Mechanical and Electrical). The information for each trade shall be provided in the following order:
 - a. The information designated by the folder names given in the Sample TOC:
 - 1) General information, as outlined in Article 3.4.A below, shall be provided first.
 - 2) Specific O&M information, as outlined in Article 3.4.B below, shall be provided next, divided into subfolders labeled by the specification section number related to that equipment.
 - a) Within each specification numbered subfolder, in addition to the basic O&M information applicable to that section number, include the related nameplate data, pump curves, flow curves, fan curves, etc.
 - b) Sub-Divide a specification section (folder) into subsections (subfolders) when the section contains documentation on multiple major equipment items.
 - c) Nameplate data, pumps curves, and other important information shall be bookmarked within each PDF.
 - d) Where multiple PDFs are included in an O&M spec section (folder), also provide a combined PDF of all the PDFs in that section folder. Name the combined PDF as follows: Combined XX-XXXXX.pdf where X = the specification number.

3.4 CONTENTS

A. Provide the following general documents:

1. **Installing Contractor Contact Information.** Provide the information required by Article 3.6 for the Installing Contractor Contact Information Form. Include the GC's or CM's contact information, along with the contact information for each major sub-contractor.
2. **Supplier Contact Information.** Provide the information required by Article 3.6 for the Supplier Contact Information Form. Provide for each major piece of equipment.
3. **Extended Warranty Information** for equipment with warranties in excess of one year. Provide the information required by Article 3.6 for the Extended Warranty Information Form.
4. **Service Agreements** for equipment with a service agreement, including service agreement contacts. Provide the information required by Article 3.6 for the Service Agreement Information Form.
5. **Inspection Report and Approval Certificates** for systems requiring Federal or State inspections such as elevators and fire alarm systems.
6. **Elevator Wiring Diagrams** (record copies)
7. **Power One Line and Riser Diagrams** (record copies)
8. **Short Circuit Analysis** with overcurrent protective device settings and fuse sizes.
9. **Valve Tag Schedule.** Provide a combined schedule for the valves installed by the various contractors/subcontractors.
 - a. The valve tag identification number shall be coordinated so that each valve has a unique tag number, and identifies the valve service e.g. CHW-25.
 - b. The schedule shall indicate the valve tag number, valve type (e.g. "ball valve"), size, approximate location (building and room #) valve service and important notes ("Main Bldg. Shut-Off"). Include a service legend (e.g. CHW = Chilled Water, LN2 = Liquid Nitrogen, etc.)

B. Provide the following equipment or system specific documents:

1. Complete **operation and maintenance instructions** for each system and major equipment item.
2. Complete **manufacturer's nameplate data** for major equipment.
3. **Manufacturer's start-up reports.**
4. **Pump curves** for pumps.
5. **Flow curves** for flow elements (pitot tube, triple duty valve, circuit setter, etc.).
6. **Fan curves** for fans.
7. **Clean and dirty filter pressure drops for each filter.**
8. **Exploded assembly views** with references to part numbers.
9. List of **manufacturers' recommended spare parts.**
10. Record copies of the **fire protection system piping schematics.**
11. Record copies of the **temperature control schematics.**
12. Record copies of the **fire alarm and security system wiring diagrams.**
13. Record copies of the **lighting controls wiring diagrams.**
14. **Software.** Provide software back-ups, pass codes, settings, etc. for controls provided by equipment manufacturers or provided for a particular system (e.g. RO/DI system PLC).

3.5 SUBMISSION

- A. To avoid delaying Owner training, Substantial Completion and final payment, complete the O&M Manual as early in the construction process as possible.
- B. Transmit all versions of the Manual using the file naming convention described in Article 3.2. Copy the U-M Project Manager on all Manual transmittals.
- C. Transmit an electronic copy of the draft final Manual to the Commissioning Authority, for review and approval.
- D. Incorporate the review comments into the final version of the Manual.
- E. Transmit the final version manual (via a file sharing site) to the Commissioning Authority, U-M Project Manager, and others as directed.

3.6 FORMS

- A. Provide, at minimum, the information listed below for each form type.
- B. Installing Contractor Contact Information Form
 - 1. U-M Project Number ("P" number)
 - 2. U-M Project Name
 - 3. Contractor/Supplier Name
 - 4. Address
 - 5. Phone Number
 - 6. Emergency Phone Number
 - 7. E-Mail
 - 8. Contractor/Supplier Project/PO Number or equivalent
 - 9. Brief description of what was installed
- C. Supplier Contact Information Form
 - 1. Items 1-8 listed in Article 3.6.B
 - 2. List of equipment or systems provided, including:
 - a. Equipment/System Name
 - b. Manufacturer
 - c. Mfr.'s PO number
 - d. Mfr.'s address, phone number, website
 - e. Model Number
 - f. Serial Number
 - g. Nominal size or capacity
- D. Extended Warranty Information Form
 - 1. Items 1-8 listed in Article 3.6.B
 - 2. Items 2.a - 2.g listed in Article 3.6.C
 - 3. Length of extended warranty with warranty start and end date
- E. Service Agreement Information Form
 - 1. Items 1-8 listed in Article 3.6.B
 - 2. Description of system or equipment covered by the service agreement, including:
 - a. Equipment/System Name
 - b. Manufacturer
 - c. Duration of agreement
 - d. Description of services provided

3.7 SAMPLE TABLE OF CONTENTS

(SEE NEXT PAGE)

✓ PXXXXX O&M Draft YY-MM-DD

✓ Arch

1-Contractor Info

2-Supplier Info

3-Extended Warranties

4-Service Agreements

5-Inspection Reports

6-Elevator Wiring Diag

✓ 7-O&Ms- Specific

07 5316 Roofing

08 1113 Doors

11 5300 Lab Equip

Z (add folders as req.d)

For each spec section folder, include all the respective O&M info as a PDF. Where this requires multiple PDFs, also provide a combined PDF of all the PDFs, also saved in that spec section folder. Bookmark important sections of individual PDFs.

✓ Elec

1-Contractor Info

2-Supplier Info

3-Extended Warranties

4-Service Agreements

5-Inspection Reports

6-Power One Line Diagrams

7-Short Circuit Analysis

✓ 8-O&Ms- Specific

26 0513 Cables

26 1100 Substations

✓ 28 1600 Security

1-Security Wiring Diag.s

Security O&M

Z (add folders as req'd)

✓ 28-3100 FA

1-FA Wiring Diag.s

FA Devices O&M

Z (add folders as req'd)

Z (add folders as req.d)

Mech

1-Contractor Info

2-Supplier Info

3-Extended Warranties

4-Service Agreements

5-Inspection Reports

6-Valve Tag Schedule

7-O&Ms- Specific

21 1313 Sprinklers

1-System Schematic

Sprinkler Devices O&M

21 3113 Fire Pump

22 0513 Motors

23 2123 Pumps

CHW Pump O&M

Z(add folders)

23 3400 Fans

Lab Fan O&M

Z (add folders as req.d)

Z (add folders as req.d)

Sample folders are shown for each spec section. Add as many folders "Z" as apply to the project.

END OF SECTION 017823

SECTION 019100 - PROJECT COMMISSIONING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings and the general provisions of the Contract, including the Standard General Conditions and the Supplemental General Conditions, apply to this Section.
- B. Refer to other Division 01 Specification Sections, including the following, for related requirements which apply to this Section.
 - 1. Division 01 Section - Project Management and Coordination.
 - 2. Division 01 Section - Submittal Procedures.
 - 3. Division 01 Section - Operation and Maintenance Manuals.
- C. Testing, balancing, commissioning, operation and maintenance manual, and Owner training requirements referenced in the other Technical Specification Sections apply to this Section.

1.2 SUMMARY

- A. Each Contractor shall perform the commissioning activities for the systems, equipment and materials they install. When the equipment and materials are part of a larger system, each Contractor shall commission their portion of the work as part of the overall system commissioning. The commissioning activities will be coordinated by the University's Commissioning Authority (CxA) and all documentation will be tracked utilizing a web-based commissioning software platform. Perform the commissioning activities as outlined in Part 3, "Execution" and as described in the U-M "Generic Sample Commissioning Plan" available for review at <http://www.umaec.umich.edu/wp-content/uploads/2013/08/Sample-Cx-Plan-Master.pdf>. Where terms, procedures, forms, etc. are indicated in this specification, the requirements for such items shall be as described in the U-M "Generic Sample Commissioning Plan".
- B. Perform commissioning activities on the following:
 - 1. Divisions 02 through 14: Systems and equipment include but are not limited to:
 - a. Power operated doors, windows, fire shutters, roof hatches, and related items.
 - b. Operable partitions.
 - c. Electric signs and graphics systems.
 - d. Motorized projection screens and projector lifts.
 - e. Fume hoods, bio-safety cabinets and snorkels.
 - f. Laboratory plumbing and electrical fixtures specified as part of laboratory casework.
 - g. Laboratory equipment including ventilated cages, sterilizers, glass washers, tunnel washers, cage and rack washers, bedding dispensers/disposers, water bottle fillers, and auto watering systems.
 - h. Darkroom equipment.
 - i. Motorized shades and blinds.
 - j. Dock levelers and truck restraint systems.

BuildingName

The Description of the Project

P00000000 0000 Issued for:XXX

019100 - 1

- k. Trash compactors
- l. Controlled environment rooms.
- m. Elevators and barrier-free lifts.
- n. Food service equipment.
- 2. Divisions 21, 22 and 23: Systems and equipment include but are not limited to:
 - a. Tunnel piping, valves, expansion joints, and loops.
 - b. Building piping, valves, expansion joints, and loops.
 - c. Meters and gauges.
 - d. Heat trace systems.
 - e. Motors, motor controllers, and variable frequency drives.
 - f. Water treatment systems.
 - g. Fire protection systems.
 - h. Piping and plumbing specialties.
 - i. Hot and cold domestic water systems.
 - j. Sanitary and laboratory waste systems.
 - k. Grease interceptors/separators.
 - l. Rainwater and storm sewer systems.
 - m. Irrigation systems.
 - n. Purified and RO/DI water systems.
 - o. Pumps.
 - p. Medical and specialty gas systems.
 - q. Natural gas systems.
 - r. Fuel oil storage and transfer systems.
 - s. Hot water heating systems.
 - t. Boilers.
 - u. Chilled water systems.
 - v. Chillers.
 - w. Cooling towers.
 - x. Condenser water systems.
 - y. Steam and condensate systems.
 - z. Engine-generator exhaust systems.
 - aa. Sand filters.
 - bb. Humidifiers.
 - cc. Heat exchangers.
 - dd. Terminal heating and cooling units.
 - ee. Energy recovery systems.
 - ff. Free cooling systems.
 - gg. Smoke evacuation systems.
 - hh. Stairwell pressurization systems.
 - ii. Point exhaust systems.
 - jj. Laboratory vacuum systems.
 - kk. Compressed air systems.
 - ll. Control air systems.
 - mm. Exhaust air systems.
 - nn. HVAC systems.
 - oo. Air handling units.
 - pp. Fans.
 - qq. Pressurization control systems.
 - rr. Mechanical systems controls.
 - ss. Laboratory and fume hood controls.
 - tt. Clean room controls.
 - uu. Kitchen Hoods.
 - vv. Kitchen exhaust controls.
 - ww. Fan coil units.
 - xx. DX systems.
 - yy. Computer room HVAC systems.

- zz. Saw dust collection systems.
- 3. Divisions 26, 27 and 28: Systems and equipment items include but are not limited to:
 - a. Primary power distribution.
 - b. Unit substations.
 - c. Secondary power distribution and metering.
 - d. Engine-generators, transfer switches and load banks.
 - e. Paralleling switchgear.
 - f. Motor starters and controls.
 - g. Wiring devices.
 - h. Grounding.
 - i. Normal and emergency lighting.
 - j. Lighting control and dimming systems.
 - k. Lighting individual controls.
 - l. Voice & data systems.
 - m. Emergency and campus telephones.
 - n. Audio/visual systems.
 - o. Room scheduler systems.
 - p. Master clocks.
 - q. Access control systems.
 - r. Security and CCTV systems.
 - s. Fire detection and alarm systems.
 - t. Emergency responder radio coverage systems.
 - u. MOSCAD (Motorola SCADA alarm transmitter to DPSS).

1.3 SUBMITTALS

- A. Provide the Commissioning Authority with the lists, forms, drawings, plans, reports, and manuals described in Part 3, "Execution".

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 COMMISSIONING ACTIVITIES

- A. Attend regularly scheduled Commissioning Team meetings, separate from other project meetings and occurring at intervals deemed appropriate by the CxA. Typically, meetings will be held **once** per month at the beginning, increasing to one per week for the last third of the project.
 - 1. Solely when dictated by the CxA, on some projects the Commissioning Team meetings will be held as part of regular project construction meetings.
- B. Attend additional commissioning meetings including but not limited to:
 - 1. Pre-start meetings.
 - 2. Functional test preparation meetings.
 - 3. Pre-balance conferences.
 - 4. Water treatment meetings.
- C. **Maintain one all-inclusive Commissioning Plan using the CxA-provided web-based software** and keep it up-to-date.

1. The CxA will provide access to the software and necessary training for Contractor personnel. The Contractor is responsible for ensuring that all relevant personnel, including subcontractors, are trained and proficient in its use. The CxA will provide technical support for the software, but the Contractor shall designate a point of contact responsible for troubleshooting and ensuring proper documentation.
2. The Commissioning Plan shall be used to store all of the documents produced during the commissioning process. The Contractor shall document all Quality Control (QC) and Commissioning (Cx) activities using the CxA-provided commissioning software. The software will serve as the primary platform for tracking, reporting, and verifying QC and Cx activities in alignment with the project schedule.
3. An initial outline of the Commissioning Plan will be created in the commissioning software by the CxA and reviewed with the Contractor soon after construction starts. This will include a list of the systems to be tested and a draft version of the required forms for each. All commissioning forms will be accessed by the Contractor through the designated software.
4. The Contractor shall provide a complete list of trade subcontractors, major manufacturers, and supplier contact information to the CxA for inclusion in the Commissioning Plan.
5. The Contractor shall record QC and Cx activities, including but not limited to inspections, checklists, tests, issue tracking, and approvals, in real-time or within 24 hours of completion.
 - a. Failure to document activities in the software as required may result in withheld payments, rework at the Contractor's expense, or other contractual impacts.
 - b. The software shall be the official record for QC and Cx compliance. Paper records or alternative tracking methods will not be accepted unless explicitly approved in writing by the CxA.
6. The types of documents within the software that are required for this project include but are not limited to:
 - a. Commissioning meeting minutes.
 - b. Interim and final commissioning reports.
 - c. Installation Sequences.
 - d. Commissioning Status Check Sheets.
 - e. Pre-Installation Check Sheets.
 - f. Pipe Flushing and Cleaning Forms.
 - g. Duct Leak Test Reports.
 - h. Pre-Start Check Sheets.
 - i. Mfr.'s reports documenting equipment start-up.
 - j. Equipment Functional Test Check Sheets.
 - k. System Functional Test Check Sheets.
 - l. Training plans and training attendance sheets.
7. Submit the following documents electronically via the CxA-provided software for systems or equipment being commissioned when such tests are required by other specification sections:
 - a. Manufacturers' factory test reports.
 - b. Field inspection and test reports.

- c. Manufacturers' check-test-start reports.
8. For projects including DDC Controls, the temperature control contractor shall provide a detailed list of every control point installed. Include, in checklist format, a detailed procedure to verify all aspects of the controls' operational sequence. These documents should be uploaded to the appropriate systems within the Cx-provided software where applicable.
- D. Assist with establishing the order, timing, and duration of the commissioning activities, and add them to the Project Schedule.
- E. The Contractor is responsible for ensuring all subcontractors comply with these requirements. Non-compliance by subcontractors shall be treated as a failure by the Contractor to meet contract obligations.
- F. During the shop drawing submittal process, submit one set of shop drawings for all systems and equipment being commissioned to the CxA for review.
1. Submit the shop drawings at the same time they are submitted to the A/E for review.
 2. The CxA assists the A/E in reviewing submittals and will not return comments directly back to the contractor.
 3. After completion of the review, provide to the CxA one set of the A/E reviewed and stamped shop drawings for all systems and equipment being commissioned.
- G. At the time of shop drawing submittal, provide to the CxA installation manuals for the systems and equipment being commissioned.
- H. Soon after construction starts, submit a draft Operation and Maintenance (O&M) Manual in accordance with the related specification section.
- I. Submit duct leak testing plans and calculations via the CxA-provided software prior to leak testing each section of duct. No testing shall commence until the plan and calculations are approved by the CxA.
- J. Submit pipe flushing and cleaning plans for each system via the CxA-provided software for CxA approval at least 2 weeks prior to the first flushing and cleaning activities.
- K. Submit electrical test reports via the CxA-provided software for CxA approval at least 2 weeks prior to equipment energization.
- L. Provide at least 2 weeks advance notification of the following activities:
1. Coordination drawing meetings. The CxA may attend.
 2. Duct leak tests. The CxA must witness duct leak tests unless waived by the CxA.
 3. Pipe flushing and cleaning of each system or portion of each system. The CxA must witness flushing and cleaning unless waived by the CxA.
 4. Manufacturer check-test-starts. The CxA may attend.
 5. Functional tests. The Commissioning Authority must witness and approve all functional tests.
 6. Owner training sessions.

- M. Check, test, and start up each system in accordance with the Manufacturer's instructions.
1. The Pre-Start Check Sheets shall be submitted using the CxA-provided software and approved prior to starting up systems and equipment. This applies both to early starts for construction use and to full startups before functional testing.
 2. Where required by the Project Specifications or by the Manufacturer, startup shall be performed by a Manufacturer's Representative. Via the CxA-provided software, submit the completed equipment start up form used by the Manufacturer's Representative during start up.
- N. Functionally test each piece of equipment and system to verify proper function in all modes of operation. Coordinate with other trades so all modes of operation can be demonstrated. Each Contractor shall demonstrate the portion of the work they provided.
1. Test each system component, zone, and control sequence.
 2. Test under both full and partial loads.
 3. Test under normal, abnormal, and emergency conditions.
 4. Test under design basis seasonal conditions.
- O. Functional testing shall include:
1. 100 percent of all major equipment
 2. 100 percent of terminal units that are controlled in any way by occupancy sensors.
 3. 100 percent of terminal units or zones that provide temperature, humidity, pressure, or similar control outside of what would be the design criteria for a typical office, e.g. those serving museum, special storage, or similar spaces.
 4. 100 percent of terminal units serving any space designated as a lab.
 5. Random functional testing of no less than 20% of fan coil units, VAV boxes, chilled beams, plumbing fixtures, lighting occupancy sensors, and similar high unit count equipment. If the quantity is 25 units or less, no less than 5 units shall be functionally tested. If significant issues are found, randomly functional test in additional increments of 10% until no significant issues are found. The CxA shall designate the specific units to be tested.
 6. Testing of electrical panel installation and individual circuiting by the electrical contractor and the CxA. The contractor shall provide voltage & amperage readings for each of the installed electrical panels and provide access to the interior of the panels for inspection by the CxA. All panel schedules and labels should be installed prior to functional testing.
- P. When requested by the CxA, provide trend logs of the controlled variables for all central equipment, and for any zone or terminal unit serving spaces with specific temperature, humidity, or pressure setpoints. For systems or equipment determined not to be operating properly by the CxA, provide logs for any additional control points requested, for trouble-shooting purposes.
1. Trend logs shall begin once each functional test is complete and continue until the equipment or system is accepted by the CxA.

2. The sampling interval and the required frequency of providing trend logs shall be as required by the CxA.

Q. Equipment and installation issues will be identified by the CxA during the project construction and functional testing of equipment. Correct the incomplete and non-conforming items that were identified. Via the CxA-provided software, the contractor is responsible to provide details on how the issue was resolved and photos of the completed work to show the final condition.

1. Deficiencies that affect system operation must be corrected prior to functional testing.
 2. Deficiencies discovered during or after functional testing must be corrected prior to acceptance of the systems by the CxA.
- R. At the same time they are submitted to the A/E for review, using the CxA-provided software, submit a copy of each Air and Water Balance Test Report to the CxA for review.
- S. Provide an electronic copy of O&M Manuals in accordance with the O&M Manual specification section a minimum of two weeks prior to scheduled Owner training.
- T. Arrange for and participate in Owner training sessions for the systems and equipment being commissioned.
1. Assist the CxA in developing a training plan. Submit for CxA approval a master list of all training sessions at least 30 days in advance of the proposed first training session. Include systems and equipment, area served, agenda, duration, time and location of each training session. The CxA will develop the final training plan which the contractor shall comply with. Dates and times of each session shall be as convenient for the Owner.
 - a. A training session may include several common types of similar systems or typical equipment that all Trainees have involvement with. Standard AHU's, fans, and ductwork can all be covered in one air handling systems training session. General lighting systems and typical power distribution systems can be covered in one electrical systems training session.
 - b. Keep unique, large or complex systems and equipment in their own training sessions (e.g. fume hoods, lab exhaust controls, emergency power systems, or large lab exhaust systems must be separate from a general air handling systems training session).
 2. Define each training session as either overview training or specific system/equipment training.
 - a. Overview training shall provide the design intent and general operation of each system and its equipment, including interactions with other systems and equipment. Overview training is generic in nature and at a level that is consistent with the level of Trainee's knowledge.
 - b. Specific system/equipment training shall include the overview followed by more detail. It is intended to expand the Trainee's specific knowledge of a particular system or equipment. Specific system/equipment training generally only applies when special training requirements are referenced in other Technical Specification Sections.

3. Training sessions shall occur after the system and equipment have passed functional testing, and after final approved O&M Manuals have been provided to the Owner.
 - a. Invite Manufacturers' representatives when required by other Technical Specification Sections or when required due to the complexity of the system or equipment.
 - b. Provide the appropriate design and coordination as-built drawings and O&M Manuals for each training session.
4. Conduct the training at the system or equipment. For specific system/equipment training, also conduct classroom training when specified or appropriate.
 - a. In conjunction with the CxA, provide overview training on the system and equipment.
 - b. Review the contents of the O&M Manual as it relates to the Training Session.
 - c. Walk down each system with the Trainees. Indicate the locations and explain the operation of basic system components such as isolation valves, drains, vents, expansion compensators, distribution piping, flow meters, electrical panels, motor controls, disconnects, lighting controls, fire alarm and security devices, roof hatch access, etc.
 - d. For specific system/equipment training, also provide the following:
 - 1) Meanings of alarms, indicators, and warning signs.
 - 2) Operating procedures under all normal, abnormal and emergency modes of operation.
 - 3) Maintenance procedures including cleaning, lubricating and adjustment procedures.
 - 4) Inspection, troubleshooting and repair procedures.
 - e. After each training session, insert a copy of the agenda and completed sign-in sheet into the Commissioning Plan.

END OF SECTION 019100