MIAMI UNIVERSITY
OXFORD, OHIO 45056
PHYSICAL FACILITIES DIVISION
FACILITIES CONTRACTING
STANDARD CONDITIONS OF CONTRACT FOR CONSTRUCTION

WILLIAMS HALL RENOVATION

PROJECT MANUAL TECHNICAL SPECIFICATIONS

March 12, 2018

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MIAMI UNIVERSITY
WILLIAMS HALL BUILDING RENOVATION

SECTION 01 1000

SUMMARY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents
2. Type of the Contract
3. Use of premises
4. Owner's occupancy requirements
5. Work restrictions
6. Specification formats and conventions

B. Related Sections include the following:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Miami University facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: **Miami University Williams Hall Renovation Project**

1. Project Location: Williams Hall
   350 South Oak Street
   Oxford, Ohio 45056

B. Owner: Miami University

1. Owner's Representative:
   Mr. Ethan Dole
   Project Manager
   Planning, Architecture & Engineering
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C. Associate: The Architectural Group, Inc.

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D. **This project will be governed by a Single Prime General Contractor agreement.**

E. The Work consists of the following:
   1. Renovation and upgrade of existing Ground Floor and Second Floor office, storage room, classroom, and corridor areas. Complete finish upgrades will be required in these areas.
   2. Work also consists of installation of new exterior wall masonry removals and installation of new single hung windows to match existing.
   3. The work will also consist of IT and AV upgrades and revisions including systems required for data and telephone communications per Miami University standards to support services.
   4. The General Contractor will be responsible for the installation of data/AV boxes and conveyances and coordinating with Miami University for work by others. The General Contractor is to remove troughs in the current computer lab that contain power and data.
   5. Miami University personnel and/or subcontractors will be responsible for the removal of data cabling raceways pertaining to the communication's box.
   6. Miami University personnel and/or subcontractors will be responsible for purchasing, supplying, installing and testing all cabling, terminations and related equipment.
   7. Mechanical and electrical modifications and upgrades are included.

F. ADD ALTERNATE
   1. All work related to the installation of new Second Floor windows shall be considered part of **ADD ALTERNATE 01** consideration inclusive of all coordination, material and labor.
   2. Work related to this effort shall include interior modifications, wall removal, structural support, window installation, flashings and sealants, exterior wall area cleaning and protection of all landscaped areas and repairs where required.

1.4 PROJECT SCHEDULE

A. The following dates represent the contractual start and completion obligations for this project:

   1. Construction Start: Monday, May 21, 2018

   2. Substantial Completion: Wednesday, August 1, 2018

B. All project schedules should reflect the above noted contractual obligation dates.

C. Coordination with Miami University Project Manager regarding other work that may occur within the same building.

1.5 TYPE OF CONTRACT

A. Project will be constructed under a **single prime contract**. See Division 01 Section "Summary of Contract" for a description of work included in the contract. Contracts for this Project include the following:

   1. General Construction

1.6 WORK UNDER OTHER CONTRACTS

A. In the event asbestos products or materials are found to be present, Miami University's Project Manager is to be immediately contacted so that Miami can address any associated issues and removals.

B. Per above, Miami University personnel and/or subcontractors will be responsible for removing all data cabling and raceways containing only data cabling and related to the

communication's box.

C. Per above, Miami University personnel and/or subcontractors will be responsible for purchasing, supplying, installing and testing all cabling, terminations and equipment.

1.7 USE OF PREMISES

A. General Contractor shall have building access for construction operations within areas of scope of work. **The General Contractor is responsible for protecting all existing walls, ceilings, floors and exterior landscaping and drive areas during construction operations including corridor carpeting, and other finishes that are to remain.**

B. Use of Site: Use of premises should be confined as necessary to areas within the Contract limits indicated, with non-work areas being used for the transportation of materials as needed. Reduce disturbance to portions of the Project site beyond areas in which the Work is indicated.

1. Confine constructions primarily to operations in areas indicated in the Drawings and as required by the project scope.

2. Owner Occupancy: Miami University personnel will require ongoing access to the buildings with public use during limited times as noted below:

3. Driveways and Entrances: Keep driveways, parking lots, loading areas and entrances serving premises clear and available to Miami University, Miami University's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

   a. Schedule deliveries to minimize use of driveways and entrances.

   b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Use of Existing Building: Repair damage caused by construction operations. Protect building during construction period.

D. Parking:

a. Expense for parking shall be required by contractors and subcontractors following guidelines and regulations set forth by Miami University's Parking Services.

b. Contractors and Subcontractors shall be eligible for parking access issued by Parking Services at the Campus Avenue Building. Parking passes must be obtained prior to the start of work and parking must be maintained within allowable areas.

E. No storage or office trailers are allowed on Miami University's Main Campus unless indicated otherwise by the University's Project Manager.. Miami will permit parking of these trailers at a designated offsite location as coordinated with Miami's Project Manager.

1.8 OWNER'S OCCUPANCY REQUIREMENTS

A. Partial-Owner Occupancy: Miami University will require access to the premises during entire construction period. Cooperate with Miami University during construction operations to minimize conflicts and facilitate Miami University's usage. Perform the Work so as not to interfere with Miami University's operations. Maintain existing exits, unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Miami University.

2. Provide not less than seventy two (72) hour's notice to University's Project Manager of activities that will affect the University's operations.

1.09 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed inside the existing building during normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except otherwise indicated. **To achieve required Milestones and Project Completion Deadlines, work hours can include evening, night and weekend work in coordination with Miami University regarding facility access.**

1. Weekend Hours: As arranged a minimum seventy two (72) hours beforehand with Miami University Project Manager.

2. Hours for Utility Shutdowns: As arranged a minimum seventy two (72) hours beforehand with Miami University's Project Manager.

3. Hours for noisy activity (including but not limited to core drilling and jack hammering): As arranged a minimum seventy two (72) hours beforehand with Miami University's Project Manager.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Miami University's Project Manager not less than seventy two (72) hours in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Miami University's Project Manager's written permission

1.10 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections according to CSI/CSC's "MasterFormat" numbering system.

1. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative and streamlined language is generally used in the Specifications. Requirements expressed in the imperative language are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted. The words "shall," "shall be," or "shall comply with," depending on the context, implied where a colon (:) is used within a sentence or phrase.

1.11 SPECIFICATION FORMATS AND CONVENTIONS

A. Review and approval by State of Ohio Department of Commerce Department of Industrial Compliance. A CPA number shall apply to project as assigned by State of Ohio Department of Industrial Compliance.

B. Fees for these permits to be issued by the State of Ohio Department of Industrial Compliance have been paid for by Miami University. All others fees shall be the responsibility of the General Contractor and Subcontractors.

C. All inspections during construction shall be the responsibility of the General Contractor for their associated work efforts.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 1400

WORK RESTRICTIONS

PART 1 - GENERAL

1.1 WORK RESTRICTIONS

A. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.

B. The General Contractor shall provide to Miami University's Project Manager's office, home and cellular telephone numbers for project managers, field supervisors and key foreman before the first application for payment is submitted.

C. Storage of materials, when outside, shall be in orderly piles or storage boxes. No material shall be stored on grass or in areas that are to remain undisturbed. No storage or office trailers are allowed on Miami University's Main Campus area. Miami will permit parking of these trailers at a designated offsite location as coordinated with Miami's Project Manager.

D. The Contractor and Subcontractors shall execute the work in a manner that will not adversely disrupt the University's operations, this includes, but is not limited to all areas outside of the limits of construction, all buildings all utility services.

E. All Contractor's personnel including Subcontractors that desire to park on Campus while working on Campus shall only park in designated University areas as defined by required parking pass procurement. Contractor and Subcontractor's personnel vehicles shall display the University's designated parking permit on the dash board at all times while on Campus. The University reserves the right to change the designated Contractor and Subcontractor's personnel parking area and lot by providing forty eight (48) hours written notice to the Contractor. The Contractor is responsible for shuttling their personnel and Subcontractors to and from designated Contractor parking lots. Any Contractor and/or Subcontractor employee who does not adhere to the requirements of this section, or who are parking anywhere else on Campus are subject to ticketing, fines, towing and permanent expulsion from working on the current capital improvement .project without any further notice. Each Contractor is solely responsible for communicating the parking requirements to all of their employees and subcontractors while on Campus, and issuing the temporary parking permits provided by the University.

F. Expense for parking shall be required by Contractor and Subcontractors following guidelines and regulations set forth by Miami University's Parking Services. Contractor and Subcontractors shall be eligible for parking access issued by Parking Services at the Campus Avenue Building. Parking passes must be obtained prior to the start of work and parking must be maintained within allowable areas.

G. Contractors' and Subcontractors' vehicles including delivery vehicles are not permitted to block or obstruct any active side walk, cross walk or roadway on Campus. The driver of all delivery trucks shall remain with their vehicle at all times. Delivery trucks are not permitted to idle near public areas or in the vicinity of air intakes of the surrounding buildings. Delivery trucks shall only park within the limits of construction.

H. The only signs that the Contractor is permitted to post are warning, emergency egress and traffic route signs.

1.2 HOURS OF OPERATION

A. Normal working hours on Campus shall be 7:00 A.M. until 5:00 P.M. Monday through Friday. If any contractor desires to work beyond working the normal working hours, they shall request permission on a daily basis from the Miami's Project Manager. **To**

achieve required Milestones and Project Completion Deadlines, work hours can include evening, night and weekend work in coordination with Miami University regarding facility access.

B. Dumpsters must be located in coordination with Miami's Project Manager.

1.3 UTILITIES

A. Utility outages must be scheduled not less than seventy two (72) working hours in advance of proposed utility interruptions by filing a written request with the University's Project Manager. The information contained within the Contractor's request must be sufficient for the University to process the request. Only the University's personnel are authorized to close and open valves. Contractor's and Subcontractors' personnel are prohibited from operating any valve or breaker on the University's utility systems with the only exception being to save a life or prevent serious injury.

B. Contractors and Subcontractors are to fully cooperate with the University during all utility outages and shut downs. Recognizing that the utility systems serve other facilities, the Contractors and/or Subcontractors shall plan tying into existing utility services during times when the systems are not functional or in low demand.

C. The storage of flammable liquids, and other hazardous materials, such-as flammable thinners, gasoline, oil, inside any occupied building or adjacent to mean of egress, or near air intakes for any building is prohibited.

D. Each Contractor is to maintain their own staging area.

E. Contractor's and Subcontractors' employees are prohibited from entering into any occupied building on Campus, or riding a University shuttle bus unless specifically escorted by a representative of the University as coordinated through Miami's Project Manager.

PART 2 - PRODUCTS

PART 3 EXECUTION (Not Used)

END OF-SECTION

SECTION 01 3100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 COORDINATION

A. The General Contractor and each Subcontractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

B. Related Sections include the following:

1. Division 01 Section "Summary" for a description of the division of Work and responsibility for coordination activities not in this Section.

2. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.

3. Division 01 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

4. Division 01 Section "Closeout Procedures" for coordinating Contract closeout.

1.2 COORDINATION

A. Coordination: The General Contractor shall coordinate all construction operations and those of the Subcontractors and entities to ensure efficient and orderly installation of each part of the Work. Each Subcontractor shall coordinate its operations with operations, included in different Sections, which depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components with other Subcontractors to ensure maximum accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components.

B. Coordination with other Miami University Projects: The General Contractor shall coordinate through Miami University's Project Manager the scope of work included with this project with other projects occurring within the projects work areas if applicable.

C. Miami University will remove all furnishings and equipment from rooms prior to commencement of work.

D. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Miami University and separate Subcontractors if coordination of their Work is required.

E. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of Subcontractors to avoid conflicts and to ensure orderly progress of the Work. Such

administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Project closeout activities.
7. Startup and adjustment of systems.
8. Project closeout activities and documentation.

F. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

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

1.3 PROJECT SCHEDULE

A. As indicated in Section 01 1000 Summary

B. All project schedules should reflect the above noted contractual obligation dates.

1.4 SUBMITTALS

A. Key Personnel Names: Within five (5) days of starting construction operations, submit to both the Design Associate and Miami's Project Manager a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, email addresses, and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other contractors.

1.6 PROJECT MEETINGS

A. General: General Contractor to manage scheduled meetings at Project site, unless otherwise indicated as noted below.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Miami's Project Manager and Design Associate of scheduled meeting dates and times.

2. Agenda: General Contractor to prepare and present meeting agenda with specific efforts delineated including those of the Subcontractors.

3. Minutes: Record significant discussions and agreements achieved. General Contractor will electronically distribute the meeting minutes to everyone concerned.

B. PRE-CONSTRUCTION MEETING: General Contractor to prepare and lead a Pre-construction Meeting before starting construction, at a time scheduled in coordination with Miami's Project Manager and Design Associate, but no later than five (5) days after execution of the Agreement. The meeting will be held at the Project site or another convenient location as approved by Miami University's Manager. The meeting will be conducted to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Miami University and Design Associate; Contractor and its superintendent, General Contractor and Subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including the following:

   a. Construction schedule

   b. Critical work sequencing and long-lead items

   c. Designation of key personnel, duties, and contact verifications

   d. Procedures for processing field decisions and Change Orders

   e. Procedures for requests for interpretations (RFIs)

   f. Procedures for inspecting

   g. Procedures for processing Applications for Payment.

   h. Submittal procedures

   i. Preparation of Record Documents

   j. Use of the premises and existing building

   k. Work restrictions

   l. Owner's occupancy requirements including other projects in same building

   m. Responsibility for temporary facilities and controls

   n. Construction waste management and recycling

   o. Parking availability

   p. Office, work, and storage areas

   q. Equipment deliveries and priorities

   r. First aid

   s. Security

   t. Progress cleaning

   u. Working hours

3. Minutes: Record and distribute meeting minutes.

C. **PROGRESS AND COORDINATION MEETINGS:** The General Contractor will conduct progress meetings at weekly intervals or at intervals approved by Miami's Project Manager. Dates of meetings will be coordinated with preparation of payment requests.

1. Attendees: In addition to representatives of Miami University and Design Associate, each Contractor, Subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of

future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Contractor's Construction Schedule:
        1. Review progress since the last meeting
        2. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule.
        3. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so.
        4. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
        5. Review schedule for next period.
    b. Review present and future needs of each entity present, including the following:
        1. Sequence of operations
        2. Status of submittals
        3. Deliveries
        4. Off-site fabrication
        5. Access
        6. Site utilization
        7. Temporary facilities and controls
        8. Work hours
        9. Hazards and risks
        10. Progress cleaning
        11. Quality and work standards
        12. Status of correction of deficient items
        13. Requests for interpretations (RFIs).
        14. Status of proposal requests
    c. Pending changes
        1. Status of Change Orders
        2. Pending claims and disputes
        3. Documentation of information for payment requests
3. Minutes will be recorded and distributed to all attendees.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
    a. Schedule Updating: Contractor's Construction Schedules will be revised after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each

meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 3200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule
2. Contractor's Construction Schedule
3. Field condition reports

B. Related Sections include the following:

1. Division 01 Section "Summary " for preparing a combined Contractor's Construction Schedule
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes
3 Division 01 Section "Submittal Procedures" for submitting schedules and reports
4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections

1.3. DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

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

Event: The starting or ending point of an activity.

Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Miami University or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

C. Major Area: A story of construction, a separate building, or a similar significant construction element.

D. Milestone: A key or critical point in time for reference or measurement.

1.4 PROJECT SCHEDULE

A. As noted in Section 01 1000 Summary.

B. All project schedules should reflect the above noted contractual obligation dates.

1.5 SUBMITTALS

A. Submittals shall be submitted to the Design Associate with copies to be retained to be later submitted as part of project closeout submittal manual.

B. Preliminary Construction Schedule: Submit one (1) electronic copy to both Miami University's Project Manager and the Associate.

C. Contractor's Construction Schedule: Submit one (1) electronic copy to both Miami University's Project Manager and the Design Associate.

D. Field Condition Reports: Submit one (1) electronic copy to both Miami University's Project Manager and the Design Associate.

1.6 QUALITY ASSURANCE

A. Construction Schedule: Conduct schedule review at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the Contractor's Construction Schedule, Including, but not limited to, the following:

1. Discuss constraints, including work stages, area separations, interim milestones, and work by others within building.
2. Review time required for review of submittals and re-submittals.
3. Review requirements for inspections.
4. Review time required for completion and startup procedures.
5. Review and finalize list of construction activities to be included in schedule.
6. Review submittal requirements and procedures.
7. Review procedures for updating schedule.

1.7 COORDINATION

A. The General Contractor shall coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of all Subcontractors.

B. The General Contractor shall coordinate the Construction Schedule with the Schedule of Values, 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 CONTRACTOR'S CONSTRUCTION SCHEDULE - GENERAL

A. Time Frame: Extend schedule from date established for the Notice-to-Proceed to date of construction Final Completion and to date of close out documents Final Completion.

B. Activities

1. Activity Duration: Define activities so no activity is longer than twenty (20) days, unless specifically allowed by Miami University.

2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than thirty (30) days, as separate activities in schedule. Procurement cycle activities include, but are not limited to submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and re-submittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.

4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Associate's administrative procedures necessary for certification of Substantial Completion.

5. 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.

6. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.

7. Work Restrictions: Show the effect of the following items on the schedule:

   a. Coordination with existing construction.

   b. Limitations of continued occupancies.

   c. Uninterruptible services.

   d. Use of premises restrictions.

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

   a. Submittals

   b. Installation

   c. Inspections

   d. Adjusting

   e. Startup and placement into final use and operation

9. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, Miami University Occupancy Requirements and Final Completion.

2.3 REPORTS

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

1. List of employees at Project site

2. Material deliveries

3. Accidents
4. Meetings and significant decisions
5. Unusual events (refer to special reports)
6. Stoppages, delays, shortages, and losses
7. Emergency procedures
8. Orders and requests of authorities having jurisdiction
9. Change Orders received and implemented
10. Construction Change Directives received and implemented
11. Services connected and disconnected
12. Partial Completions and occupancies
13. Substantial Completions authorized

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule three (3) days before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Design Associate, Miami's Project Manager, Subcontractors, and other parties with a need-to-know schedule responsibility.

1. Post copies in temporary field office.
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

SECTION 01 3300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
2. Division 0I Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
3. Division 01 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.
4. Division 01 Section "Closeout Procedures" for submitting warranties.
5. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
6. Divisions 02 through 26 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Associate’s responsive action.

B. Informational Submittals: Written information that does not require Associate’s responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Upon request electronic copies of CAD Drawings of the Contract Drawings will be provided by Design Associate for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, delivery, other submittals, and related activities that require sequential activity.
2. 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. Design Associate reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled

performance of related construction activities.

D. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Design Associate'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 re-submittals.

1. Initial Review: Allow five (5) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Associate will advise Contractor when a submittal being processed must be delayed for coordination:
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Re-submittal Review: Allow two (2) days for review of each re-submittal.
4. Concurrent Consultant Review: When transmitted simultaneously to Design Associate and to Associate's consultants, allow five (5) days for review of each submittal. Submittal will be returned to Design Associate before being returned to the General Contractor.

E. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 4 inches by 4 inches (200 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Associate.
3. Include the following information on label for processing and recording action taken:
    a. Project name
    b. Date
    c. Name and address of Associate
    d. Name and address of Contractor
    e. Name and address of Subcontractor
    f. Name and address of Supplier
    g. Name of manufacturer
    h. Submittal number or other unique identifier, including revision identifier.
        1. Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).
    i. Number and title of appropriate Specification Section
    j. Drawing number and detail references, as appropriate
    k. Location(s) where product is to be installed, as appropriate
    l. Other necessary identification
    m. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless Associate observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one (1) paper and electronic copy of submittal to concurrent reviewer in

addition to specified copy to Design Associate.

2. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.

G. Transmittal: Package each submittal individually and appropriately for-transmittal and handling. Transmit each submittal using a transmittal form. Design Associate will return submittals, without review, received from sources other than the General Contractor.

1. Transmittal Form: Provide locations on form for the following information:

a. Project name

b. Date

c. Destination (To:)

d. Source (From:)

e. Names of subcontractor, manufacturer, and supplier

f. Category and type of submittal

g. Submittal purpose and description

h. Specification Section number and title

i. Drawing number and detail references, as appropriate

j. Transmittal number

k. Submittal and transmittal distribution record

l. Remarks

m. Signature of transmitter

2. On an attached separate sheet, prepared on the General Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Design Associate on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

H. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are marked "NO EXCEPTION" or "REVIEWED AND NOTED"

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, and authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

Use for Construction: Use only final submittals with mark indicating "NO EXCEPTION" or "REVIEWED AND NOTED" taken by Associate.

1.5 CONTRACTOR'S USE OF ASSOCIATE'S CAD FILES

A. General: At the General Contractor's request, copies of Design Associate's CAD files will be provided to the General Contractor for their use in connection with Project, subject to the following conditions:

1. Acceptance and signing of the Design Associate's CAD Disclaimer prior to the release of any electronic files.

PART 2- PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

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

1. If information must be specially prepared for submittal because standard printed 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 written recommendations
    b. Manufacturer's product specifications
    c. Manufacturer's installation instructions.
    d. Standard color charts
    e. Compliance with specified referenced standards
    f. Testing by recognized testing agency. Application of testing agency labels and seals. Notation of coordination requirements.
4. Submit Product Data before or concurrent with Samples.
5. Number of Copies: Submit one (1) electronic copy of Product Data, unless otherwise indicated. Mark up and retain one (1) returned copy for the Design Associate as a Project Record Document.
6. Electronic submittals may be submitted to Design Associate with receipt documentation required from associate confirming delivery of information.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Dimensions
    b. Identification of products
    c. Fabrication and installation drawings
    d. Roughing-in and setting diagrams
    e. Shopwork manufacturing instructions
    f. Templates and patterns
    g. Schedules
    h. Design calculations
    i. Compliance with specified standards
    j. Notation of coordination requirements
    I. Notation of dimensions established by field measurement
    m. Relationship to adjoining construction clearly indicated

2. Number of Copies: Submit one (1) electronic copy of each submittal, unless copies are required for operation and maintenance manuals..

3. Coordinate with Design Associate regarding electronic submissions.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples - that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample

b. Product name and name of manufacturer

c. Sample source

d. Number and title of appropriate Specification Section

3. Disposition: Maintain sets of approved Samples at Project site, available for quality control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit three (3) full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Associate will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three (3) sets of Samples. Associate will retain one (1) 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.

E. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

F. Schedule of Values: Comply with requirements specified in Miami University’s Contract

requirements. Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information In tabular form:

1. Name, address, email addresses, and telephone number of entity performing subcontract or supplying products.
2. Number of Copies: Submit one (1) electronic copy of subcontractor list to Miami's Project Manager and one (1) electronic copy to the Associate, unless otherwise indicated.
    a. Mark up and retain one returned copy as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit one (1) electronic copy of each submittal, unless otherwise indicated. Associate will not return copies.
2. Certificates and Certifications: Provide a notarized 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.
3. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

C. Contractor's Construction Schedule: Comply with requirements specified Division 01 Section "Construction Progress Documentation."

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

E. Installer Certificates: Prepare 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.

F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

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

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

I. Material Test Reports: Prepare 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.

J. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

K. Schedule of Inspections: Comply with requirements specified in Division 0I Section

"Quality Requirements."

L. Maintenance Data: Prepare written instructions and procedures for normal maintenance of products.

M. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page-numbers.

N. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates
2. Required substrate tolerances
3. Sequence of installation or erection
4. Required installation tolerances
5. Required adjustments
6. Recommendations for cleaning and protection

O. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles; if any, and term of the coverage. Coordinate with Miami's Project Manager and contracting service regarding these submittals.

P. Material Safety Data Sheets (MSDSs): Submit information directly to Miami's Project Manager; do not submit to Design Associate.

1. Design Associate will not review submittals that include MSDSs and will return them for re-submittal.

PART 3 - EXECUTION

3.1 GENERAL CONTRACTOR'S REVIEW

A. 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 Design Associate.

B. 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 the General Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ASSOCIATE'S ACTION

A. General: Associate will not review submittals that do not bear the General Contractor's approval stamp and will return them without action

B. Action Submittals: Design Associate will review each submittal, make marks to indicate corrections or modifications required, and return it. Associate will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. NO EXCEPTION

2. REVIEWED AND NOTED
3. REVISE AND RESUBMIT
4. REJECTED

C. Informational Submittals: Design Associate will review each submittal and will not return it, or will return it if it does not comply with requirements. Design Associate will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered non-responsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

SECTION 01 4000

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Related Sections include the following:

1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required inspections.

2 Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by inspecting activities.

3. Divisions 02 through 26 Sections for specific inspection requirements.

1.3 DEFINITIONS

A. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality Control Services: Inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Design Associate.

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

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

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

F. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five (5) previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Design Associate for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable

limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements refer uncertainties to Design Associate for a decision before proceeding

1.5 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection by a recognized authority

B. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue
2. Project title and number
3. Dates and locations of inspections
4. Names of individuals making inspections
5. Description of the Work and inspection method
6. Identification of product and Specification Section
7. Complete inspection data
8. Comments or professional opinion on whether inspected Work complies with the Contract Document requirements
9. Name and signature of inspector
10. Recommendations on retesting and re-inspecting

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

1.6 QUALITY ASSURANCE

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

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation- of manufacturer’s products that are similar in material, design, and extent to those indicated for this Project.

1.7 QUALITY CONTROL

A. Inspections not explicitly assigned to Miami University are the General Contractor's responsibility. Unless otherwise indicated, provide quality control services specified and

those required by authorities having jurisdiction. Perform quality control services required of the General Contractor by authorities having jurisdiction, whether specified or not.

1. Inspection requested by the General Contractor and not required by the Contract Documents are Contractor's responsibility.

B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

C. Re-inspecting: Regardless of whether original inspections were the General Contractor's responsibility, provide quality-control services, including re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Associated Services: Cooperate with agencies performing inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.

2. Incidental labor and facilities necessary to facilitate inspections.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 INSPECTION LOG

A. Prepare a record of inspections. Include the following:

1. Date inspection was conducted.

2. Description of the Work inspected.

3. Date inspection results were transmitted to Design Associate.

4. Identification of special inspector conducting inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Design Associate’s reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of inspecting and similar services, repair damaged construction and restore substrates and finishes.

1. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are the General Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections include the following:

1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
3. Division 01 Section "Execution Requirements" for progress cleaning requirements.
4. Divisions 02 through 26 Sections for ventilation, and humidity requirements for products in those Sections.

1.3 USE CHARGES

A. General: Cost or use charges for temporary Contractor facilities shall be included In the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to Miami University, Design Associate, and authorities having jurisdiction.

B. Water and Sewer Service: Water and Sewer from Miami University's existing water and sewer system is available for use without metering and without payment of use charges.

C. Electric Power Service: Electric power from Miami University's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 SUBMITTALS

A. Site Plan: Show staging areas and parking areas for construction personnel. Coordinate with Miami's Project Manager regarding acceptable parking, storage and staging areas.

1.5 QUALITY ASSURANCE

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

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

1.6 PROJECT CONDITIONS

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

PART 2 PRODUCTS

2.1 TEMPORARY FACILITIES

A. Storage: Provide storage area to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.2 EQUIPMENT

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

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Connect to existing service:

1. Arrange with Miami's Project Manager for time when service can be interrupted, if necessary, to make connections for services.

B. Water Service: Use of Miami's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Miami University. At Substantial Completion, restore these facilities to condition existing before initial use.

1. Toilets: Use of existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Miami University. At Substantial Completion, restore these facilities to condition existing before initial use.

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

D. Electric Power Service & Lighting: Use of Miami University's existing electric power service and lighting will be permitted, as long as equipment is maintained in a condition acceptable to Miami University.

E. The General Contractor shall be responsible for temporary project lighting during the period of time after the existing fixtures have been removed and prior to the installation and use of the new light fixtures.

3.3 SUPPORT FACILITIES INSTALLATION

A. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site including curbs, pavement, and utilities.

2. Maintain access for fire-fighting equipment and access to fire hydrants.

B. Parking: Use designated areas of Miami University's existing parking areas for construction personnel.

1. Project Identification and Temporary Signs: Provide Project identification and other signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted: Provide temporary, directional signs for construction personnel and visitors.

2. Maintain and touchup signs so they are legible at all times.

C. Waste Disposal Facilities: Each Contractor is responsible for waste removal of waste related to their own work. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution Requirements" for progress cleaning requirements.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air or water contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Division 01 Section "Summary."

B. Site Control: Maintain security by limiting number of access cards, keys and/or key cards and restricting distribution to authorized personnel.

C. Security: Install safety barriers at ongoing areas of construction. Prevent unauthorized entrance, vandalism, theft, and similar violations of security.

D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities essential and intended uses.

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

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a twenty four (24) hour basis where required to achieve indicated results and to avoid possibility of damage.

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

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility.

E. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor.

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

END OF SECTION

SECTION 01 6000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections include the following:

1. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.

2. Divisions 02 through 26 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published-product literature that is current as of date of the Contract Documents.

2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

A. Substitution Requests: Submit one (1) electronic copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution requests should be submitted to Design Associate for review and approval.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

    a. Statement indicating why specified material or product cannot be provided.

    b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Miami University and separate contractors that will be necessary to accommodate proposed substitution.

    c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

    e. Samples, where applicable or requested.

    f. If list of similar installations for completed projects with, project names and addresses and names and addresses of architects and owners.

    g. Written material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

    h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

    i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

    j. Cost information, including a proposal of change, if any, in the Contract Sum,

    k. General Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

    l. The General Contractor's waiver of rights to additional payment or time thatmay subsequently become necessary because of failure of proposed substitution to produce indicated results:

3. Design Associate’s Action: If necessary, Design Associate will request additional information or documentation for evaluation within two (2) calendar days of receipt of a request for substitution. Design Associate will notify Contractor of acceptance or rejection of proposed substitution within two (2) calendar days of receipt of request, or two (2) calendar days of receipt of additional information or documentation, whichever is later.

    a. Use product specified if Design Associate cannot make a decision on use of a proposed substitution within time allocated.

B. Comparable Product Requests: Submit one (1) electronic copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

    1. Design Associate's Action: If necessary, Design Associate will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Design Associate will notify General Contractor of approval or rejection of proposed comparable product request within two (2)

calendar days of receipt of request, or two (2) calendar days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."

b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: if the General Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. General Contractor and Subcontractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.

2. If a dispute arises between contractors over concurrently selectable but incompatible products, Associate will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units: Store materials in a manner that will not endanger Project structure.

2. Store products that are subject to damage by the elements, under cover in a weather tight enclosure above ground, with ventilation adequate to prevent condensation.

3. Protect stored products from damage and liquids from freezing.

4. Provide a secure location and enclosure at Project site for storage of materials and equipment by Miami University’s construction forces. Coordinate location with Miami University’s Project Manager.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve the General Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual

manufacturer for a particular product and specifically endorsed by manufacturer to Miami University.

2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Miami University.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.

3. Refer to Divisions 02 through 26 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 – PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A General Product Requirements: Provide products that comply with the Contract Documents that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete Installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Miami University reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Associate will make selection.

5. Where products are accompanied by the term "match sample," sample to be matched is Associate's.

6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.

2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.

3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a

product by one of the manufacturers listed that complies with requirements.

5. Available Products: Where Specifications include a list of names of both- products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics, that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample or “built-in” existing item, select a product that complies with requirements and matches existing conditions Associate’s sample. Associate’s decision will be final on whether a proposed product matches.
    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, and textures" or a similar phrase; select a product that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Design Associate will select color, pattern, density; or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Design Associate will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Design Associate will consider requests for substitution if received within two (2) calendar days after the Notice-to-Proceed. Requests received after that time may be considered or rejected at discretion of Design Associate.

B. Conditions: Design Associate will consider the General Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Design Associate will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Miami University a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Miami University must assume. Miami University's additional responsibilities may include compensation to Associate for redesign and evaluation services, increased

cost of other construction by Miami University, and similar considerations.

2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect the General Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

A. Conditions: Design Associate will consider the General Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Design Associate will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2 Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 7000

EXECUTION REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following: General installation of products, progress cleaning, starting and adjusting, protection of installed construction, correction of the Work.

B. Related Sections include the following: Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities: Division 01 Section "Submittal Procedures" for submitting surveys and Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.

C. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Miami University accepted deviations from indicated lines and levels, and final cleaning.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Acceptance of Conditions: 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. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Examine roughing-in for electrical systems to verify actual locations of connections before equipment and fixture installation.

3. Examine walls for suitable conditions where products and systems are to be installed.

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

3.2 PREPARATION

A. 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, submit a request for information to Associate. Include a detailed description of problem encountered, together with recommendations for changing Documents.

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 and wiring in finished areas, unless 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. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Design Associate.

2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including inserts, anchor bolts, and items with integral anchors, that are to be embedded in masonry or other materials. Deliver such items to Project site in time for installation.

G. 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.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly . Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Containerize unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

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

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
3. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

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

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

F. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

G. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

H. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 STARTING AND ADJUSTING

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

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

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

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure Installed Work is without damage or deterioration at time of Substantial Completion.

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

3.7 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching"

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 01 7310

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Division 01 Section "Selective Demolition" for demolition of selected portions of the building.
2. Divisions 02 through 26 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to match existing visual and subsurface conditions.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio. Particular attention to be given to new window cut-ins.

B. 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 those results in increased maintenance or decreased operational life or safety. Operating elements include the following:

1. Primary operational systems and equipment;
2. Air or smoke barriers;
3. Mechanical systems piping;
4. Control systems;
5. Communication systems;
6. Electrical wiring systems;
7. Fire alarm systems and equipment.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or results in increased maintenance or decreased operational life or safety. Miscellaneous elements include, but are not limited to the following:

1. Equipment supports;
2. Piping, ductwork, and equipment;

3. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Design Associate's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials upon pre-approval of selected product and finish characteristics by Design Associate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability .of substrates, including compatibility with in-place finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3. Prime contractors to coordinate extend of removals prior to starting work.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching: Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Masonry: Drill using a non-impact machine.

4. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch finish surface construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

SECTION 01 7320

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of building or structure.

B. Related Sections include the following:

1. Division 01 Section "Summary" for use of premises and Owner-occupancy requirements.

2. Division 01 Section “Temporary Facilities and Controls" for temporary construction and environmental protection measures for selective demolition operations.

3. Division 01 Section "Cutting and Patching" for cutting and patching procedures.

1.3 DEFINITIONS

A. Remove: Detach and/or designated items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Miami University.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Items of interest or value to Miami University that may be encountered during selective demolition will remain Miami University's property and are indicated on the construction documents. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Miami University.

1. Coordinate with Miami University's Project Manager, who will establish special procedures for removal and salvage.

1.5 PROCESSES COORDINATION

A. Detail sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Miami University's on-site operations are uninterrupted.

B. Interruption of utility services: indicate how long utility services will be interrupted.

C. Coordinate shutoff, capping, and continuation of utility services.

D. Locate proposed dust and noise control temporary partitions and means of egress, including for other occupants affected by selective demolition operations.

E. Coordinate Miami's continuing occupancy of portions of existing building.

F. Coordinate Miami University's partial occupancy of completed Work.

G. Provide means of protection for items to remain and items in path of waste removal from building.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI A10.6 and NFPA 241.

C. Pre-construction Meeting: Conduct a pre-construction meeting at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods, procedures, and coordination related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be selectively demolished and extent of the construction.

2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

5. Review areas where existing construction is to remain and requires protection.

1.7 PROJECT CONDITIONS

A. Miami University will occupy portions of the building immediately adjacent to selective demolition areas. Conduct selective demolition so Miami University's operations will not be disrupted.

1. Comply with requirements specified in Division 01 Section "Summary."

B. Conditions existing at time of inspection for bidding purpose will be maintained by Miami University as far as practical.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Miami University's Project Manager. Miami University will remove hazardous materials under a separate contract if applicable.

D. Storage or sale of removed items or materials on-site is not permitted. Storage on-site is permitted for removed and relocated materials.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped where required by construction activities.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Contact Miami University's Project Manager for clarifications.

E. Survey of Existing Conditions:

1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
2. Confirm exact window locations for new work prior to any masonry or interior finish removals.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."

B. Service/System Requirements: Locate, identify, disconnect, and seal off indicated utility services serving areas to be selectively demolished.

1. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

2. Where entire wall areas are to be removed, existing services may be removed with partial removal of the wall.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent facilities to remain where required.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

3. Cover and protect equipment that has not been removed.

4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower levels or in coordination with Miami University's Project Manager

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

5. Dispose of demolished items and materials promptly.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Miami's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION

SECTION 01 7700

CLOSEOUT PROCEDURES

PART 1-GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to the following:

1. Inspection procedures
2. Warranties
3. Final cleaning
4. Project Closeout

B. Related Sections include the following:

1. Division 01 Section "Execution Requirements" for progress cleaning of Project site.
2. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Divisions 02 through 26 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request:

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
3. Obtain and submit releases permitting Miami University unrestricted use of the Work and access to services and utilities. Include occupancy permits, and similar releases.
4. Prepare and submit Project Record Documents, operation and maintenance manuals.
5. Deliver tools, spare parts, extra materials, and similar items to location designated by Miami University. Label with manufacturer's name and model number where applicable.
6. Coordinate with Miami University Key Shop to confirm cores have been keyed and installed by MU.
7. Terminate and remove temporary facilities from Project site, construction tools, and similar elements.
8. Submit changeover information related to Miami University's use, operation, and maintenance.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual

defects.

B. Inspection: Submit a request for inspection for Substantial Completion. On receipt of request, Design Associate will either proceed with inspection or notify Contractor of unfulfilled requirements. Design Associate will prepare the Certificate of Substantial Completion after inspection and will notify Contractor of items, either on Contractor's list or additional items identified by Design Associate, that must be completed or corrected before final certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for final completion and subsequent submission of the Certificate of Contract Completion.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit one (1) electronic copy of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by the General Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

a. Project name
b. Date
c. Name of Design Associate
d. Name of General Contractor
e. Page number

1.5 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Miami University payment procedure.

2. Submit certified copy of Design Associate's Substantial Completion inspection list of items to be completed or corrected (Punch List), endorsed and dated by Design Associate. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit evidence of final, continuing insurance coverage complying with Insurance requirements.

4. Instruct Miami University's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Design Associate will either proceed with inspection or notify Contractor of unfulfilled requirements. Design Associate will prepare a final Certificate for Payment after inspection or will notify the General Contractor of construction that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

C. Finalized Certificate of Warranty Commencement Certificate of Contract Completion and the Payment Release Affidavit.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Design Associate for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2” by 11” inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor and subcontractors.

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

PART 2-PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site in areas disturbed by construction activities, including rubbish, waste material, litter, and other foreign substances.

b. Remove spills, stains, and other foreign deposits.

c. Remove tools, construction equipment, machinery, and surplus material from Project site.

d. Remove floor protection materials.

e. Clean exposed interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition.

f. Remove debris and surface dust from limited access spaces, including plenums and

similar spaces.

g. Sweep floors clean in unoccupied spaces.

h. Clean transparent materials, including mirrors.

i. Remove labels that are not permanent.

j. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

k. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

l. Replace parts subject to unusual operating conditions.

m. Leave Project-clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Miami's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 01 7810

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections include the following:

1. Division 01 Section "Summary" for coordinating Project Record Documents covering the Work of multiple contracts.
2. Division 01 Section "Closeout Procedures" for general closeout procedures.
3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Divisions 02 through 26 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Record Drawings: Provide one (1) printed copy of drawings on bond paper and provide on CD, thumb drive, or other data storage device, one (1) set of electronic as-built drawings in PDF format.

B. Record Specifications: Comply with the following:

1. Record specifications: Provide one (1) printed copy of specifications on bond paper and provide on CD, thumb drive, or other data storage device with modifications noted in red throughout the specification documents.

C. Record Product Data: Submit one (1) copy of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

D. Record Management Data: Submit one (1) copy of the following:

1. Safety Meeting Minutes
2. Site Field Conditions Record
3. RFIs
4. Construction Change Directives (CCD)
5. Change Orders (CO)
6. Addenda

PART 2 – PRODUCTS

2.1 RECORD DRAWINGS

A. Maintain one (1) set of drawings of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Drawings to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Accurately record information in an understandable drawing technique.
   c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Mark record sets with colors to distinguish between changes for different categories of the Work at same location.

3. Mark important additional information that was either shown schematically or omitted from original Drawings.

4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record CAD Drawings:

1. Format: DWG format CAD program documents.

2. Incorporate changes and additional information previously marked on Record Prints.

3. Delete, redraw, and add details and notations where applicable.

4. Refer instances of uncertainty to the Associate for resolution.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Design Associate determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.

2. Consult Design Associate for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
2. Identification: As follows:
   a. Project name
   b. Date
   c. Designation "PROJECT RECORD DRAWINGS"
   d. Name of Design Associate
   e. Name of Contractor

2.2 RECORD SPECIFICATIONS

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

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

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

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.

5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

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

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

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

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

B. Miscellaneous Record Submittals

1. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 – EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one (1) copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Associate's reference during normal working hours.

1. Maintenance documentation directory.

2. Emergency manuals.

3. Maintenance manuals for the care and maintenance of products, materials, finishes, systems, and equipment.

C. Related Sections include the following:

1. Division 01 Section "Summary of the Contract" for coordinating operation and maintenance manuals covering the. Work of multiple contracts.
2. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
3. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
4. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
5. Divisions 02 through 26 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

3.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

3.3 SUBMITTALS

A. Final Submittal: Submit one (1) copy of manual in final Project Manual form.

1. Correct or modify Project Manual 'to comply with Design Associate's comments. Submit three (3) copies of corrected Project Manual prior to submission of final Contractor of Payment Request and issuance of Certificate of Project Completion.

3.4 COORDINATION

A. Where maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

3.5 MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

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

B. Tables of Contents: Include a table of contents for each emergency and maintenance manual.

3.6 PROJECT MANUAL - GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page
2. Table of contents
3. Manual contents

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual
2. Name and address of Project
3. Name and address of Owner
4. Date of submittal

5. Name, address, and telephone number of the General Contractor
6. Names, addresses, and telephone numbers of the Subcontractors
7. Name and address of Associate
8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to. hold 8 ½ by 11 inch (215-by-280-rnm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

   a. Identify binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents.

2. Dividers: Heavy paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and. major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual. .

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.

4. Supplementary Text: Prepared on 8 ½ by 11-inch (215-by-280-mm) white bond paper.

5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

3.7 PROJECT MANUAL - OPERATIONS

A. Descriptions: Include the following:

1. Product name and model number
2. Manufacturer's name
3. Equipment identification with serial number of each component
4. Limiting conditions
5. Complete nomenclature and number of replacement parts

3.8 PRODUCT MANUAL - MAINTENANCE

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name .and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number;
2. Manufacturer’s name;
3. Color, pattern, and texture;
4. Material and chemical composition;
5. Reordering information for specially manufactured products;

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Types of cleaning agents to be used and methods of cleaning
2. List of cleaning agents and methods of cleaning detrimental to product
3. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

3.9 PROJECT MANUAL PREPARATION

A. Maintenance: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work and indicating maintenance of each system, subsystem, and piece of equipment not part of a system.

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

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

D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2 Comply with requirements of newly prepared Record Drawings in Division 01 Section “Project Record Documents."

3

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

END OF SECTION

SECTION 03 0130

RESURFACING AND REHABILITATION OF CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resurfacing of concrete floors.

1.02 RELATED SECTIONS

A. Section 01 7310 - Cutting and Patching

B. Section 01 7320 - Selective Demolition

C. Section 09 6600 - Resilient Tile Flooring

D. Section 09 6813 - Tile Carpeting

1.03 REFERENCES

A. AASHTO M 148 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2001.

B. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2003.

1.04 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. See Section 01 3300 – Submittal Procedures for submittal procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: Mapei Corporation; 1144 East Newport Center Drive, Deerfield Beach, FL 33442. ASD. Tel: (954) 246-8888 or (800) 42-MAPEI. Fax: (954) 246-8800. www.mapei.com

2.02 APPLICATIONS/SCOPE

A. See drawings for extent of work where walls have been removed.

B. Interior Floors:

1. For Patching: Use Traffic Surface Repair Mortar, Interior Repair Mortar, or Interior Repair Mortar compatible with new floor covering manufacturer's product recommendations as required in floor areas types immediately noted above.

C. Bonding New Concrete to Old Concrete: Use epoxy adhesive.

2.03 INTERIOR MATERIALS

A. Self-Leveling Thin Topping Underlayment: Pre-blended cementitious, for thicknesses from feather edge to 1/2 inch.
   1. Acceptable Product: Mapei Novo/Plan 5, fast setting; for over cured concrete and exterior grade plywood.
   2. Primer: As recommended by topping manufacturer.

B. Interior Repair Mortar: Pre-blended cementitious patching mortar for concrete.
   1. Acceptable Product: Mapei Planitop 22; two-component, fast-setting, polymer-modified, synthetic fiber reinforced; for vertical and horizontal surfaces, 1/8 inch to 1-5/8 inches per coat.
   2. Acceptable Product: Mapei Quickcem Top 101; one-component, fast-setting, non-shrinking, self-curing; for horizontal surfaces, feather edge to 1 inch per coat.
   3. Acceptable Product: Mapei Planitop 10; one-component, fast-setting; for floor surfaces, feather edge to 1/4 inch thick.
   4. Acceptable Product: Portland cement, sand, and Mapei Planicrete AC or SB mix; for minimum 3/8 inch thickness.
   5. Primer: As recommended by topping manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Do not apply leveling infill material between existing floor tiles in the event tiles are not fully adhered to the concrete substrate.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 04 0120

MAINTENANCE OF MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 SCOPE

A. Repairing unit masonry, including replacing units.

B. Repointing joints.

C. Cleaning exposed unit masonry surfaces.

D. Preconstruction Testing

1. Preconstruction : Contractor to perform preconstruction testing on masonry units in limited area with inspection by Associate and Miami University Project Manager.

E. Quality Assurance

1. Cleaning: Clean an area approximately 25 sq. ft. for surface condition inspection before cleaning wall surface area indicated on the drawings.

F. Sequencing: Perform masonry restoration work in the following sequence:

1. Clean masonry surfaces.
2. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
3. Repair masonry, including replacing existing masonry with new masonry materials.
4. Rake out mortar from joints to be repointed.
5. Point mortar joints and strike to match existing joint condition.
6. After new work, repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

PART 2 PRODUCTS

A. Face Brick: Provide face brick to match adjacent existing in areas around new windows as m as may be required.

1. Provide units with colors, color variation within units, surface texture, and physical properties to match existing units in size and shape.

B. Mortar Materials

1. Portland Cement: ASTM C 150, Type I or Type II, white or gray or both where required for color matching of exposed mortar.
2. For pointing mortar, provide sand with rounded edges.
3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
4. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

C. Cleaning Materials

1. Nonacidic Liquid Cleaner: Manufacturer’s standard mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.

PART 3 EXECUTION

A. Protection

1. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.
    a. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of new and cleaning work.
2. Comply with chemical-cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical-cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
    a. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
    b. Keep wall wet below area being cleaned to prevent streaking from runoff.
    c. Do not clean masonry during windows of sufficient force to spread cleaning solutions to unprotected surfaces.
    d. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
    e. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
3. Prevent mortar from staining face of surrounding masonry and other surfaces.
    a. Cover sills, ledges, and projections to protect from mortar droppings.
    b. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
    c. Immediately remove mortar in contact with exposed masonry and other surfaces.
    d. Clean mortar splatters from scaffolding at end of each day.

B. Brick Removal and Replacement
1. At locations indicated, remove bricks required for new window installation. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
2. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
3. Remove in an undamaged condition as many whole bricks as possible.
4. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.
5. Replace removed damaged brick with brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.
6. Install replacement brick into bonding and coursing pattern of existing brick. If cutting required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
7. Lay replacement bricks when required with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) or more than 30g/30 sq in per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.

8. Tool exposed mortar joints in repaired areas to match line struck joints of surrounding existing brickwork.

C. Cleaning Masonry

1. Proceed with cleaning in an orderly manner; work from bottom to top of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.
2. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
3. Chemical-Cleaner application Methods: Apply chemical cleaners to masonry surfaces to comply with Chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.
4. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of treat rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
    a. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.
5. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

D. Repointing Masonry

1. Rake out and repoint joints where required to the following extent:
    a. Joints where mortar is missing.
    b. Joints where they sound hollow when tapped by metal object.
    c. Joints indicated as sealant-filled joints.
2. Pointing with Mortar:
    a. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces is damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
    b. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
    c. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow becoming thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.
    d. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
    e. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours including weekends and holidays.
    f. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

END OF SECTION

SECTION 04 2000

UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete Block.

B. Clay Facing Brick.

C. Reinforcement and Anchorage.

D. Flashings.

E. Lintels.

F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 7310 - Cutting and Patching

B. Section 01 7320 - Selective Demolition

C. Section 04 0120 - Maintenance of Masonry

D. Section 07 9005 - Joint Sealers

E Section 08 5213 - Metal Clad Wood Windows

1.03 REFERENCE STANDARDS

A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International; 2005.

B. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 2005.

C. ASTM A 82/A 82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.

D. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2005.

E. ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2003.

F. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2007a.

G. ASTM C 129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2006.

H. ASTM C 140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2007a.

I. ASTM C 216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2007a.

J. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout; 2007.

K. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2006.

L. ASTM C568/C568M – Standard Specification for Limestone Dimension Stone; 2015.

1.04 SUBMITTALS

A. See Section 01 3300 – Submittal Procedures for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Samples: Submit two samples of each unit type to illustrate color, texture, and extremes of color range.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.

1.06 MATERIAL VERIFICATION

A. Construct a masonry mock-up panel to include masonry veneer brick units, mortar with proper mortar color and raking to match existing. Review and approval required prior to proceeding with the work.

B. Locate where directed.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. CMU's shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
   2. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depths as indicated on the drawings for specific locations.
   3. Shapes: Provide non-standard blocks configured for corners, lintels, headers, and other detailed conditions.
   4. Loadbearing Units:
      a. Both hollow and solid block, as required as part of existing wall removal and rebuilding around new windows.
      b. Medium weight. Load bearing concrete block shall be continuously reinforced with 9 gauge truss type reinforcing at 16 in. o.c. maximum vertically.

2.02 FACE BRICK UNITS

A. Manufacturers:
   1. Belden Brick www.beldenbrick.com.
   2. Substitutions: None allowed

B. Existing Facing Brick:
   1. Save removed masonry facing brick for possible reuse where necessary around new window opening.
   2. Removed existing brick units to be toothed into perimeter window areas if required to accommodate new work completion.

C. New Facing Brick: ASTM C 216, Type FBS, Grade SW.
   1. Color and texture to match Miami University standard Belden - Berwick Blend
   2. Actual or nominal size: Match existing condition units.
   3. Compressive strength: Measured in accordance with ASTM C 67.

2.03 MORTAR AND GROUT MATERIALS

A. Aggregate for mortar and grout, cement and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland cement Type I or II, except Type II may be used for cold weather construction.

C. Hydrated Lime: Type S.

D. Masonry Cement: ASTM C91

E. Aggregate for Mortar: Use washed aggregate consisting of natural sand or crushed stone of color necessary to produce required mortar color.

F. Aggregate for Grout: ASTM C 404

G. Grout for Unit Masonry: Comply with ASTM C 476.

H. Mortar for Unit Masonry: Comply with ASTM C 270. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

I. General: Do no use admixtures unless otherwise indicated.
   a. Do not use calcium chloride in mortar or grout
   b. Use masonry cement mortar unless otherwise indicated.

J. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to endure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

K. Pigments for Colored Mortar: Natural and synthetic iron oxides, compounded for mortar mixes specifically intended for mixing into mortar and complying with ASTM C 979.
   1. Color(s): Match existing adjacent grout color.

L. Water: Clean and potable.

M. Accelerating Admixture: Nonchloride type for use in cold weather.

N. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.

O. Cleaners: Nonacidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.

2.04 STONE SILLS

A. Limestone:
   1. Buff Indiana Oolitic limestone shall be used, except where other types might be required to match existing stone.
   2. Limestone: Complies with ASTM C568/C568M, Type II (Medium Density) Classification.
      a. Variety: Indiana Limestone.
      b. Absorption by Weight: 7.5 maximum percentage; ASTM C97/C97M.
      c. Density: 135 lbs/cu ft (2160 kg/cu m), minimum; ASTM C97/C97M.
      d. Compressive Strength: 4000 psi (28 MPa), minimum; ASTM C170/C170M.
      e. Modulus of Rupture: 700 psi (3.4 MPa), minimum; ASTM C99/C99M.

B. Color & Texture: To match existing

C. Grade Classifications: Provide limestone of the following grade(s) at locations as indicated on the drawings in compliance with samples and shop drawings approved by the Associate.
   1. Standard

2.05 REINFORCEMENT AND ANCHORAGE

A. General Note:

   1. Reinforcement and anchorage in areas specific to the removal of existing veneer masonry at new window installation areas shall be adjusted as necessary to provide proper stabilization of existing u nits to remain surrounding new windows.

B. Manufacturers of Joint Reinforcement and Anchors:
   1. Dur-O-Wal: www.dur-o-wal.com.
   2. Hohmann & Barnard, Inc: www.h-b.com.
   3. Masonry Reinforcing Corporation of America: www.wirebond.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

C. Adjustable Multiple Wythe Joint Reinforcement:

   1. Truss type with adjustable ties spaced at 16 in on center and fabricated with moisture drip; ASTM A 82/A 82M steel wire, hot dip galvanized after fabrication to ASTM A 153/153M, Class B; 0.1875 inch side rods with 0.1875 inch cross rods and adjustable components of 0.1875 inch wire; width of components as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from each masonry face.

D. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
   1. Anchor plates: Not less than 0.105 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
   2. Wire ties: Triangular shape, 0.1875 inch thick.
   3. Vertical adjustment: Not less than 2 inches.
   4. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.

E. Masonry Joint Reinforcement for Double Wythe Masonry: Either ladder type or truss type with single pair of side rods.

F. For the purpose of joint replacement, wire mesh type is prohibited. Trussed type 9 gauge galvanized wire with hook and eye face brick over concrete block is preferred over ladder types.

2.06 FLASHINGS

A. Metal Flashing Materials: Soft-tempered copper sheet bonded on both side with elastic asphaltic compound.

B. Copper conforming to ASTM B370 (1210 Alloy)

C. Mastic for Asphalt Coated Flashing

D. Manufacturers:
   1. Hohmann & Barnard, Inc.: www.h-b.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.07 ACCESSORIES

A. Nailing Strips: Softwood lumber, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.

B. Weeps: Match existing type. Install plastic or metal vents in all masonry weep holes. Rope wicks, tubes, and open weep holes are not acceptable.

1. Manufacturers:
    a. Dur-O-Wal: www.dur-o-wal.com.
    b. Hohmann & Barnard, Inc: www.h-b.com.
    c. Masonry Reinforcing Corporation of America: www.wirebond.com.
    d. Substitutions: See Section 01 6000 - Product Requirements.

C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.08 LINTELS

A. Steel L-angles: As indicated on drawings. or

B. Precast Concrete Lintels: As option

PART 3 EXECUTION

3.01 EXAMINATION

A. Confirm locations of masonry areas to be removed to accommodate new window units.

B. Verify that field conditions are acceptable and are ready to receive masonry.

C. Verify that related items provided under other sections are properly sized and located.

3.02 PREPARATION

A. Protect all adjacent areas including vegetation exteriorly as well as all interior finishes. Coordinate saw cutting time periods with Miami University Project Manager to assure non-interference with ongoing operations.

B. Direct and coordinate placement of metal anchors supplied for installation under other sections.

C. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and forty eight (48) hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and forty eight (48) hours after completion of masonry work.

3.04 COURSING

A. Establish lines, levels, and coursing indicated to match existing adjacent conditions. Protect from displacement.

B. Maintain masonry courses to uniform dimension to match existing adjacent conditions. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
1. Bond: Running.
2. Coursing: One unit and one mortar joint to equal 8 inches.
3. Mortar Joints: Concave.

D. Brick Units:
1. Bond: As indicated for different locations.
2. Coursing: Three units and three mortar joints to equal 8 inches to match existing conditions

3. Mortar Joints: Flush with nail **grape-vine** joint to match existing conditions

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Interlock intersections and external corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Cut mortar joints flush where wall tile is scheduled.

I. Tooth-in masonry units as required following removal of masonry areas to accommodate new windows.

3.06 WEEPS/CAVITY VENTS

A. Install minimum of two weeps in veneer walls immediately above steel lintel at each window opening.

3.07 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

3.08 REINFORCEMENT AND ANCHORAGE – INTERIOR CMU SINGLE WYTHE MASONRY

A. Confirm horizontal joint reinforcement at new window perimeter locations interrupted by installation of new windows.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Confirm extension a minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Reinforce joint corners and intersections with strap anchors 16 inches on center.

3.09 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Confirm horizontal joint reinforcement at new window perimeter locations interrupted by installation of new windows.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Confirm extension a minimum 16 inches each side of opening.

C. Lap new joint reinforcement ends minimum 6 inches.

D. Masonry Back-Up: Embed anchors in masonry back-up to bond veneer at maximum 2-2/3 sq. ft. of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

E. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 2-2/3 sq. ft. of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

F. Reinforce joint corners and intersections with strap anchors 16 inches on center.

3.10 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Extend asphaltic coated metal flashings through exterior face of masonry and turn down to form drip. Install joint sealer below drip edge to prevent moisture migration under flashing.

C. Extend flashings to within 1/4 inch of exterior face of masonry.

D. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

3.11 LINTELS

A. Install precast concrete or steel angle lintels for the interior CMU wythe over openings as indicated on drawings.

B. Install steel angle lintels for the exterior brick veneer wythe over openings as indicated on drawings.

C. The steel for lintels should comply with ASTM A 36.

D. Steel angle lintels: 3/8 in. with a horizontal leg of at least 3 1/2 in. and 5 in. vertically

3.12 BUILT-IN WORK

A. As work progresses, install built-in window frames, anchor bolts, and plates and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of door frames in adjacent mortar joints.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

3.13 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft. and 1/2 inch in 20 ft. or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft. and 1/4 inch in 10 ft.

E. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.14 CUTTING AND FITTING

A. Cut and fit as required to accommodate new lintels, flashing, sills and windows. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000.

B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C 140 for conformance to requirements of this specification.

3.16 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

E. Clean interior work areas and finish as indicated on the drawings.

3.17 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 06 1000

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A Preservative treated wood materials.

B. Fire retardant treated wood materials.

C. Miscellaneous framing.

D. Concealed fire resistant wood blocking, nailers, and supports.

E. Miscellaneous wood nailers.

1.02 RELATED REQUIREMENTS

A. Section 06 2000 – Finish Carpentry

B. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2009.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.

E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2012.

F. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood Protection Association; 2012.

G. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology, Department of Commerce; 2010.

H. SPIB (GR) - Grading Rules; Southern Pine Inspection Bureau, Inc.; 2002.

I. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; West Coast Lumber Inspection Bureau; 2004, and supplements.

J. WWPA G-5 - Western Lumber Grading Rules; Western Wood Products Association; 2011.

1.04 SUBMITTALS

A. See Section 01 3300 – Submittal Procedures for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials, and application instructions.

C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five (5) year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Lumber fabricated from old growth timber is not permitted.

B. Lumber salvaged from deconstruction or demolition of conditions in the existing area or structures is permitted in lieu of sustainably harvested lumber provided it is clean, de-nailed, free of paint and finish materials, and other contamination, and meets required fire resistant and moisture resistant characteristics.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).

B. Grading Agency: West Coast Lumber Inspection Bureau (WCLIB).

C. Grading Agency: Western Wood Products Association (WWPA).

D. Sizes: Nominal sizes as indicated on drawings, S4S.

E. Moisture Content: S-dry or MC19.

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.

2.03 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
   3. Anchors: Toggle bolt type for anchorage to hollow masonry.

2.04 FACTORY WOOD TREATMENT

A. Treated Lumber: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
   1. Manufacturers:
      a. Arch Wood Protection, Inc; www.wolmanizedwood.com.
      b. Hoover Treated Wood Products, Inc; www.frtw.com.
      c. Osmose, Inc; www.osmose.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.
   2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional twenty (20) minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. All interior rough carpentry items are to be fire retardant treated.
      c. Treat rough carpentry items as indicated.

d. Do not use untreated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
1. Manufacturers:
a. Arch Wood Protection, Inc; www.wolmanizedwood.com.
b. Viance, LLC; www.treatedwood.com.
c. Osmose, Inc; www.osmose.com.
d. Substitutions: See Section 01 6000 - Product Requirements.
2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft (4.0 kg/cu m) retention.
a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
b. Treat lumber in contact with flashing or waterproofing.
c. Treat lumber in contact with masonry or concrete.
d. Treat lumber in other locations as indicated.
3. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft (4.0 kg/cu m) retention.
a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
b. Treat plywood in contact with flashing or waterproofing.
c. Treat plywood in contact with masonry or concrete.
d. Treat plywood in other locations as indicated.

D. Component Backing Products – Optional backing system
1. Manufacturers: ClarkDietrich Building Systems; http://www.clarkdietrich.com
a. Basis-of-Design Product: Subject to compliance with requirements; Danback Fire-Retardant Treated Wood Backing Plate

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fire blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing or as indicated on the drawings.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Specifically, provide the following non-structural framing and blocking:
1. Wall brackets

2. Wall-mounted door stops
3. Pinup boards, marker boards, signage, and other items as coordinated with the University
4. Wall and base trim

3.04 CLEANING

A. Waste Disposal
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground.

END OF SECTION

SECTION 06 2000

FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood Chair Rail and Trim

B. Attachment accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 07 9005 - Joint Sealers

C. Section 09 9000 - Painting and Coating: Painting and finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.

B. AWI (QCP) - Quality Certification Program, www.awiqcp.org; current edition at www.awiqcp.org.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.

D. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 2010.

E. WI (CCP) - Certified Compliance Program (CCP); current edition at www.woodworkinstitute.com/certification.

1.04 SUBMITTALS

A. See Section 01 3300 – Submittal Procedures for submittal procedures.

B. Submittal Document: Indicate materials, component profiles, fastening methods, and jointing details.

C. Samples: Submit one (1) sample of chair rail and trim to match existing. Size to be a minimum of 6” inch in length illustrating trim design to match existing removed.

1.05 QUALITY ASSURANCE

B. Quality Certification: Provide AWI Quality Certification Program inspection report and quality certification of completed work.
   1. Prior to delivery to the site provide shop drawings.
   2. Replace, repair, or rework all work for which is refused by Miami University Project Manager and/or Design Associate.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI Architectural Woodwork Standards for Premium Grade.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Interior Woodwork Items:
   1. Chair Rail and Trim: Varnished hardwood.

2.02 ACCESSORIES

A. Adhesive: Type recommended by installer to suit application in conjunction with attachment screws.

B. Fasteners: Size and type to suit application.

C. Screws: Of size and type to suit application; galvanized finish in concealed locations.

2.03 FABRICATION

A. When advantageous to project shop assemble work for delivery to site,.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.04 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. Finishing as follows:
   1. Sheen: Semi-gloss.
   2. Seal internal surfaces and semi-concealed surfaces. Brush apply only.

D. Back seal woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing.

B. See Section 06 1000 Rough Carpentry for installation of recessed fire resistant material wood blocking.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site finish woodwork areas impacted by installation.

3.04 TOLERANCES

A. Maximum Variation from true position: 1/16 inch.

B. Maximum Offset from true alignment with abutting materials: 1/32 inch.

END OF SECTION

SECTION 07 2100

THERMAL INSULATION

PART 1 – GENERAL

1.01 SUMMARY

A. Glass fiber acoustical insulation for interior walls and ceilings in commercial buildings.

1.02 RELATED PRODUCTS

A. Section 09 9007 - Joint Sealers
B. Section 09 2116 - Gypsum Board Assemblies

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. E84 Test Method for Surface Burning Characteristics
   2. E90 Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
   3. E136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees F. (unfaced)
   4. C423 Test Method for Sound Absorption and the Sound Absorption Coefficient by the Reverberation Room Method

1.04 SUBMITTALS

A. Product Data: Submit Owens Corning product literature, installation instructions and product samples for specified insulation.
B. See Section 01 3300 – Submittal Procedures for submittal procedures.

1.05 DELIVERY, STORAGE & HANDLING

A. Protect insulation from physical damage and from becoming wet or soiled. Comply with manufacturer's recommendations for handling, storage and protection during installation
B. Label for insulation packages to include material name, production date and/or product code.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Owens Corning (QuietZone) - Basis of Design

2.02 ACOUSTIC BATT INSULATION

A. Type I: Unfaced glass fiber insulation complying with ASTM C 665 and ASTM E 136.
B. Surface burning characteristics
   1. Unfaced Insulation:
      Maximum flame spread: 10
      Maximum smoke developed: 10
   2. Maximum smoke developed: not rated
C. Combustion Characteristics: Unfaced insulation passes ASTM E 136 test.
D. Dimensional Stability: Linear stability less than 0.1%.

Part 3 – EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this section will be installed.
B. Verify that adjacent materials are dry and ready. Verify that electrical and mechanical services within walls have been inspected and tested. Verify that project drawings comply with installation requirements.

3.02 INSTALLATION

A. Comply with manufacturer's instruction for particular conditions of installation in each case.
B. Between metal studs: Friction-fit unfaced insulation between studs after cover material has been installed on one side of the cavity. Secure to hold in place.
C. Top of Acoustical Ceiling Tiles: Install on top of ceiling tiles a minimum of two (2) feet each side of newly installed demising wall where indicated on the drawings if applicable.

3.03 Material Storage and Protection

A. Protect insulation from damage and from becoming wet before, during and after installation.

END OF SECTION

SECTION 07 8400

FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping materials.

B. Firestopping of all penetrations and interruptions to fire rated assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED SECTIONS

A. Section 01 7000 - Execution and Closeout Requirements: Cutting and patching.

B. Section 04 2000 - Unit Masonry

C. Section 07 2100 - Thermal Insulation

D. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fire-rated assemblies.

1.03 REFERENCES

A. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2000a.

B. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2002.

C. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

D. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

E. FM 4991 - Approval of Firestop Contractors; Factory Mutual Research Corporation; 2001

F. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

1.04 SUBMITTALS

A. See Section 01 3300 – Submittal Procedures, for submittal procedures.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs which provide the scheduled fire ratings when tested in accordance with methods indicated, ASTM E 814, and ASTM E 119.
   1. Listing in the current classification or certification books of UL will be considered as constituting an acceptable test report.
   2. Current evaluation reports published by IBC will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three (3) years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Approved by Factory Mutual Research under FM Standard 4991, Approval of Firestop Contractors, or meeting any two of the following requirements:.
      a. Licensed by authority having jurisdiction.
      b. Approved by firestopping manufacturer.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for three (3) days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 FIRESTOPPING ASSEMBLIES

A. Firestopping: Foam; Caulk or putty; Manufactured device.

2.02 MATERIALS

A. Elastomeric Firestopping: Single component elastomeric compound and compatible sealant; conforming to the following:
   1. Adhesion and Bond To Substrate: Adhesion to all construction substrates.
   2. Density: Minimum: 10 lb/gal.
   3. Durability and Longevity: Permanent.
   4. Color: Redish brown; light gray.
   5. Manufacturer:
      a. Per facility standard.

B. Foam Firestopping: Multiple component foam compound; conforming to the following:
   1. Adhesion and Bond To Substrate: 15 psi.
   2. Density: 18-25 lb/cu ft.
   3. Color: Dark grey to black elastomeric foam.
   4. Manufacturer:
      a. Per facility standard.

C. Fiber Packing Material: Mineral fiber packing insulation; conforming to the following:
   1. Density: Minimum - 4 lb/cu. ft.
   2. Durability and Longevity: Permanent.
   3. Manufacturer:
      a. Per facility standard.

D. Firestop Devices: Mechanical device with incombustible filler and sheet stainless steel jacket, collar, and flanged stops; conforming to the following:
   1. Manufacturer:
      a. Per facility standard.

E. Intumescent Putty: Compound which expands on exposure to surface heat gain; conforming to the following:
   1. Potential Expansion: Minimum 3X.
   2. Adhesion and Bond To Substrate: All substrates
   3. Density: Minimum 60 lb/cu ft. or 8 lb/gal.
   4. Color: Red-Brown.
   5. Manufacturers:
      a. Per facility standard.

F. Primers, Sleeves, Forms, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may

affect bond of firestopping material.

B. Remove incompatible materials which may affect bond.

C. Install backing or damming materials to arrest liquid material leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authority having jurisdiction.

C. Install labeling required by code.

D. Coordinate concealed area inspections with local jurisdiction, if such inspections are required.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces of firestopping materials.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9005

JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sealants.

1.02 RELATED SECTIONS

A. Section 09 9000 - Painting and Coating

1.03 REFERENCES

A. ASTM C 834 - Standard Specification for Latex Sealants; 2000.

B. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2002.

C. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2000.

1.04 SUBMITTALS

A. See Section 01 3300 – Submittal Procedures for submittal procedures.

B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

C. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.06 COORDINATION

A. Coordinate the work with all sections referencing this section.

1.07 WARRANTY

A. See Section 01 7700 - Closeout Procedures, for additional warranty requirements.

B. Correct defective work within a one (1) year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SEALANTS

A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the South Coast Air Quality Management District Rule No.1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.

B. Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

C. Type A - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type OP, Grade NF single component, paintable.
   1. Color: Standard colors matching finished surfaces as provided by Associate.
   2. Basis of Design: Pecora, Inc.: www.pecora.com
   3. Applications used for:

a. Joints between door frames and wall surfaces.
b. Other interior joints for which no other type of sealant is indicated.

D. Type B - Acoustical Joint Sealant
1. Performance Requirement:
a. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction.
1. Sealant shall have a VOC content of 250 g/L or less.
2. Acoustical Sealant for Concealed Joints: Manufacturer's standard nonsag, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber acoustical sealant.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Basis of Design: Pecora Corporation: www.pecora.com

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces and joint openings are ready to receive work.

3.02 PREPARATION

A. Remove loose materials and foreign matter which might impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C 1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C 1193.

C. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

D. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Tool joints concave.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION OF FINISHED WORK

A. Protect sealants until cured.

END OF SECTION

SECTION 08 1113

HOLLOW METAL DOORS & FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Steel frames for wood doors.

1.02 RELATED SECTIONS

A. Section 06 2000 - Finish Carpentry

B. Section 08 1416 - Flush Wood Doors

C. Section 08 7100 - Door Hardware.

D. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

E. Section 09 9000 - Painting and Coating: Field painting.

1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

B. ANSI A250.3 - Test Procedure and Acceptance Criteria for Factory-Applied Finish Painted Steel Surfaces for Steel Doors and Frames; 2007.

C. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.

D. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2004).

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2010.

F. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

G. ASTM E413 - Classification for Rating Sound Insulation; 2010.

H. ASTM E1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems; 1991 (Reapproved 2000).

I. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

J. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007.

K. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 1992.

L. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2006.

M. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 3300 – Submittal Procedures for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations,

reinforcement type and locations, anchorage and fastening methods, and finishes.

C. Shop Drawings: Details of each opening, showing elevations, glazing, and frame profiles.

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three (3) years documented experience.

B. Maintain at the project site a copy of all reference standards dealing with installation.

C. See Section 01 7700 - Closeout Submittals for additional warranty requirements.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Store in accordance with NAAMM HMMA 840.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Door Frames:
1. Assa Abloy Ceco, Curries, or Fleming: www.assaabloydss.com.
2. Republic Doors; www.republicdoor.com.
3. Steelcraft, an Allegion brand; www.allegion.com.
4. Steelcraft; www.steelcraft.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOOR FRAMES

A. Requirements for All Hollow Metal Doors and Frames:
1. Accessibility: Comply with ANSI/ICC A117.1.
2. Door Top Closures: Flush with top of faces and edges.
3. Door Edge Profile: Beveled on both edges.
4. Door Texture: Smooth faces.
5. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
6. Finish: Factory primed, for field finishing.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement.

2.03 ACCESSORY MATERIALS

A. Glazing: As required to meet fire rating

B. Removable Stops: Formed sheet steel, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard for exterior doors and frames.

2.04 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.02 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. Coordinate frame anchor placement with wall construction.

C. Coordinate installation of hardware.

D. Coordinate installation of glazing.

E. Touch up damaged factory finishes.

3.03 TOLERANCES

A. Clearances Between Door and Frame: As specified in ANSI A250.8.

B. Maximum Diagonal Distortion: 1/16 in (1.5 mm) measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust door within frame for smooth and balanced door movement.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule on drawings.

END OF SECTION

SECTION 08 1416

FLUSH SOLID CORE DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush configuration; non-rated.

B. Flush wood doors; flush configuration; rated.

1.02 RELATED SECTIONS

A. Section 06 2000 - Finish Carpentry

B. Section 08 7100 – Door Hardware

C. Section 08 1113 - Hollow Metal Doors & Frames

D. Section 09 9000 - Paints and Coatings

1.03 REFERENCES

A. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2003.

B. ICC (IBC) - International Building Code; 2003.

1.04 SUBMITTALS

A. See Section 01 3300 – Submittal Procedures for submittal procedures.

B. Shop Drawings: Provide coordination documents of doors supplied by Miami University and installed by Contractor.

C. Indicate special installation instructions required for relocation of doors and hardware.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three (3) years of documented experience.

B. See Section 01 7700 - Closeout Submittals for additional warranty requirements.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Store existing relocated doors in coordination with Miami University in temporary site locations.

B. Protect existing relocated doors.. Do not store in damp or wet areas.

1.07 PROJECT CONDITIONS

A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.08 WARRANTY

A. See Section 01 7700 - Closeout Procedures for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Veneer Doors: (Typical Miami University door type)
   1. VT Industries – Heritage VT Door Type
   2. Marshfield DoorSystems, Inc: www.marshfielddoors.com.

3. Oshkosh Door Company: www.oshkoshdoor.com

2.02 DOORS

A. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Quality Standard: AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Section 1300, Premium Grade with A grade veneer.
   2. Wood Veneer Faced Doors 5-ply hot press plain sliced oak to match existing.
   3. Wood veneer facing for factory finish, color as stained, sealed, and top coated.

B. Relocated Interior Wood Doors: Relocated existing interior wood doors in coordination with Miami University. Modify door as required to accommodate hinges and strike configurations. Refinish per Paints and Coatings specification section.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core Doors: Type particleboard core (PC), plies and faces as indicated above.

B. Rated Solid Core Doors: Type incombustible mineral core, plies and faces as indicated above.

2.04 DOOR FACINGS

A. Wood Veneer Facing for Transparent Finish: Typical - Plain sliced match
   1. Vertical Edges: Same species as face veneer.

2.05 DOOR CONSTRUCTION

A. Adjust doors as required for hardware in accordance with hardware requirements and dimensions.

B. Provide edge clearances in accordance with AWI Quality Standards Illustrated Section 1700. Clearances: 1/8” top, 1/8” lock and hinge stiles.

C. Standard Bevel: 1/8” in 2”.

D. Cutouts: 3-5/16” minimum distance between lite and lock cutout and 5” minimum distance from door edge.

E. Security Rating: Class 40.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

D. Prior to relocating existing door(s), inspect opening to receive relocated door and adjust as necessary to accommodate relocated door.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm).
   1. Trim door height at bottom edge only.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

F. Modify relocated doors and door jambs to accommodate relocated doors and new or relocated hardware.

3.03 INSTALLATION TOLERANCES

A. Conform to specified quality standard for fit and clearance tolerances and for maximum diagonal distortion.

B. Maximum Diagonal Distortion (Warp): 1/8 inch measured with straight edge or taut string, corner to corner, over an imaginary 36 by 84 inches surface area.

C. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 by 84 inches surface area.

D. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 by 84 inches surface area.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

SECTION 08 5213

METAL CLAD WOOD WINDOWS

PART 1 - SCOPE

1.1 Section Includes

A. Aluminum clad single-hung windows, complete with aluminum brickmould, hardware glazing, weather stripping, jamb extensions, anchorages, trim, attachments, and accessories.

B. Provide insect screens on all operable windows.

C. Windows shall have simulated divided lites.

D. All glass shall have no visible tint. Obscure glass is acceptable within private or service spaces.

E. Provide window position switches for interconnect to BMS.

1.2 References

A. American Society for Testing Materials (ASTM):
   1. E283: Standard Test method for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors
   2. E330: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Door by Uniform Static Air Pressure Difference
   3. E547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential
   4. E2190: Specification for Sealed Insulated Glass Units
   5. C1036: Standard Specification for Flat Glass
   6. E2068: Standard Test Method for Determination of Operating Force of Sliding Windows and Doors
   7. E 1996: Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes
   8. E 1886: Standard Test method for Performance of Exterior Windows, curtain Walls, and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
   9. F 2090-10: Standard Specifications for Windows Fall Prevention Devices with Emergency Escape (egress) Release Mechanisms

B. American Architectural Manufacturer's Association/Window and Door Manufacturer's Association (AAMA/WDMA/CSA):
   1. AAMA/WDMA/CSA 101/I.S.2/A440-08, Standard/Specification for windows, doors and skylights
   2. AAMA/WDMA/CSA 101/I.S.2/A440-11, Standard/Specification for windows, doors and skylights
   3. AAMA 450-10, Voluntary Performance Rating Method for Mulled Fenestration Assemblies

C. WDMA I.S.4: Industry Standard for Water Repellant Preservative Treatment for Millwork

D. Window and Door Manufacturer's Association (WDMA): 101/I.S.2 WDMA Hallmark Certification Program

E. Sealed Insulating Glass Manufacturer's Association/Insulating Glass Certification Council (SIGMA/IGCC)

F. American Architectural Manufacturer's Association (AAMA): 2605: Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels

G. National Fenestration Rating Council (NFRC):
   1. 101: Procedure for Determining Fenestration Product thermal Properties
   2. 200: Procedure for Determining Solar Heat Gain Coefficients at Normal Incidence

H. Window Covering Manufacturer's Association
   1. A100.1: American National Standard for Safety of Corded Window Coverings Products

PART 2 - PRODUCTS

A. Performance Requirements: The manufacturer shall submit copies of test reports, made or witnessed by an independent testing laboratory, which show conformance to the specified performance standards.

B. Warranty: Provide a written guarantee, guaranteeing that all parts of the installation will meet specified performance requirements and will be free from defects in materials and workmanship for a period of two (2) years following acceptance. Weather-stripping shall be guaranteed for a period for five (5) years. Guarantee shall certify that all work is in accordance with the manufacturer's recommended installation requirements and shall contain a statement that should any defect develop during the guarantee period, caused by improper workmanship or materials, such defects will be repaired or windows will be replaced at no expense to the University.

C. Window Frames and Sashes shall be grade "CW" or "AW".

D. All windows shall have dual glazing. With Low E (Sputtered on second surface) and argon gas to improve energy performance. Provide max. whole unit U-value of .33 maximum.

E. For maintenance purposes, it is preferred that all windows be arranged, manufactured and installed so that complete maintenance can be accomplished from the room side, including glazing, washing, screening and normal repairs.

F. Window Opening Control Devices: A window opening control device kit, similar to Anderson Window AW #902197, should be installed at any operable window that may be accessed directly from grade or via an easily accessed adjacent structure.

1. Rooms: control device should have an integral override to allow full opening of window after an initial 6 in. maximum stop at first floor.

G. Basis of Design: Marvin Windows (Warroad, MN.), Aluminum Clad Ultimate Single Hung – Next Generation 2.0

1. Frame: Finger jointed edge-glued pine or Douglas fir head and side jambs. Kiln dried and water repellent preservative treated in accordance with WDMA I.S.4
2. Sash: Clear pine or Douglas fir kiln dried and water repellent preservative treated in accordance with WDMA I.S.4. Corner slot and tenoned.
3. Sash: Unit must be able to be broke down to facilitate replacement of insulated glazing unit.
4. Interior/Exterior Finishes:
    a. Interior: Factory primed, white with interior finish color to match interior trim color.
    b. Exterior: Fluoropolymer modified acrylic topcoat applied over primer. Meets AAMA 2605 requirements
5. Hardware:
    a. Balance system: Coil spring block and tackle with nylon cord and fiber filled nylon clutch.
    b. Jamb carrier: Vinyl extrusion with wood inserts. Color: Beige.
    c. Lock: High pressure zinc die-cast cam lock and keeper; Finish selected by Architect from Manufacturer's standards.
    d. Checkrail guide.
    e. Custodial sash lock operable only with special tool or non-tiling window function.
6. Weather strip: Operating units: Continuous leaf weather strip at head jamb parting stop; dual durometer bulb at check rail; foam bulb type dual durometer weather strip on vertical sash edge; dual durometer bulb weather-strip at bottom rail. Color; Beige.
7. Jamb Extension: Factory installed Jamb extension for wall thickness indicated or required. Finish: Match interior finish.

8. Insect Screen:
    a. Screen and its associated hardware shall fit within a 4 9/16” frame, minimal exposure and shall not interfere with common window dressings
    b. Pull bar will protrude beyond the interior 4 9/16” plane of the window
    c. Standard Screen Mesh: Stiffened High Transparency Mesh
    d. Pull Bar Latch Hardware
9. Simulated Divided Lites (SDL): Match existing adjacent window with; Pine, Douglas fir, vertical grain Douglas fir adhered to glass with closed-cell acrylic foam tape.
    a. Pattern: Rectangular; Custom lite layout
    b. Finish: Match sash finish

PART 3 - EXECUTION

A. A window mock-up is required. In addition to window mock-ups, it will be required that after the first window has been installed by the regular work crew; it shall be inspected and tested to endure full compliance with approved shop drawings, and with all related standards and specified requirements, before the remaining windows are installed. The Associate, General Contractor, Sub-Contractor, and related trades, together with the window manufacturer’s representative will be required to be present at this first installation, and be expected to give a written report or approval before proceeding further.

B. All window units must pass a water infiltration test. A full mock-up will be required prior to the University accepting and specialized window designs or configurations.

END OF SECTION

SECTION 08 7100

DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Survey of existing door hardware conditions and operations

B. Hardware for solid core wood doors

C. Commercial door hardware:
   1. Swinging doors.
   2. To support proper operation and function of the door including hinges, locks and latches, cylinders and keys, strikes, closers, silencers, smoke seals and stops.

D. Products supplied by Miami University and installed by Contractor

E. Locking/latching door hardware cores removed and supplied by Miami University with subsequent installation by Miami University

F. Keying by Miami University

G. Products supplied and installed by Contractor

1.02 RELATED SECTIONS

A. Section 08 1416 - Flush Solid Core Doors.

1.03 REFERENCES

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 1998.

B. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; Door and Hardware Institute; 1993.

C. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 3300 – Submittal Procedures for submittal procedures.

B. Coordination Shop Drawing/Document and product data:
   1. Indicate door location of door hardware products and hardware operation type for each new and relocated doors and confirm with Miami University
   2. All new fire-rated door hardware
   3. Additional hardware specified and not provided by Miami University

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three (3) years of documented experience.

B. Hardware Supplier Qualifications: Company specializing in supplying institutional door hardware with ten (10) years of documented experience.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Inventory hardware items provided by Miami University and identify each hardware item according to door opening location.

B. Protect new hardware items and identify each hardware item according to door opening location.

1.07 COORDINATION

A. Coordinate the work with others directly affected sections involving relocation, manufacture or

fabrication of internal reinforcement for door hardware.

B. Furnish templates for new door and frame preparation.

C. Final Keying:
   1. Contractor to assist in inventorying existing doors to be relocated and coordinate with Miami University Project Manager regarding final door and hardware location.
   2. Miami University to remove cores form existing relocated door latching/locking sets.
   3. Miami University to key removed cores and reinstall in location as coordinated with Contractor.
   4. New door locking hardware to be purchased and installed by contractor with removable Best cores to be shipped from manufacturer to Miami University Key Shop. Key shop to install cores.

1.09 WARRANTY

A. Provide ten (10) year warranty for door closers.

B. See Section 01 7700 - Closeout Submittals for additional warranty requirements.

1.10 MAINTENANCE PRODUCTS

A. Provide special wrenches and tools applicable to each different or special hardware component.

B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS & GENERAL INFORMATION

NOTE: Products to be provided by Miami University for installation by Contractor and for purchase and installation by Contractor are listed below.

A. Hinges: Heavy Duty, 5 Knuckle – Ball bearing type
   1. Manufacturers: Hager Roton, Stanley, Ives &Assa Abloy - McKinney: www.mckinneyhinge.comMcKinney
   2. Std. Wgt. Hinge TA2714 4 ½" x 4 ½" US26D
   3. Hvy Wgt Hinge T4A3786 5"x4 ½" US26D
   4. McKinney Design Basis
   5. Doors and hinges to be relocated to be reviewed by Contractor prior to construction and coordinated as necessary with existing and new jambs including hinge locations and sizes..

B. Mortise Lock and Latch Sets:
   1. Key System: Best Access N/A – Univ. Std. (& pin per Miami University Standards)
   2. Locks: Schlage mortise locks
   3. Schlage: Basis of Design
   4. Doors and door hardware to be relocated to be reviewed by Contractor prior to construction and coordinated as necessary with existing and new jambs. Contractor to coordinate with Miami University regarding MU's removal, keying and installation efforts.

C. Strikes: 4 7/8" Curved Lip Strike
   1. Manufacturer: Schlage
   2. Schlage: Basis of Design
   3. Doors and door hardware to be relocated to be reviewed by contractor prior to construction and coordinated as necessary with existing and new jambs.

D. Closers:
   1. Manufacturer: LCN
   2. No substitution.

3. Closer: Surface Mounted 4040 Series
4. Location: Locations as indicated in schedule.
5. LCN: Basis of Design
6. Door hardware to be relocated to be reviewed by Contractor prior to construction and coordinated as necessary.

E. Wall Stop
1. Manufacturers: Ives, Hager, Rockwood, Assay Abloy: www.rockwoodmfg.com
2. No substitution.
3. Rockwood RM861: Basis of Design

F. Door Silencers
1. Manufacturer: Assay Abloy: www.rockwoodmfg.com
2. No substitution.
3. Rockwood 608: Basis of Design
4. Door hardware to be relocated to be reviewed by Contractor prior to construction and coordinated as necessary.

G. Smoke Seals
1. Manufacturer: Assay Abloy: www.assaabloydooraccessories.us
2. Basis of Design: Substitution submittal allowed.
3. Pemko HSS2000xs44

2.02 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

A. Provide products that comply with the following:
1. Applicable provisions of Federal, State, and local codes.
2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
3. Applicable provisions of NFPA 101, Life Safety Code.
4. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

B. Finishes: All finishes are US26D or equivalent, unless noted otherwise.

2.03 KEYING

A. Door Locks/Latches & Final Keying:
1. Miami University to remove cores form existing relocated door latching/locking sets.
2. Miami University to key removed cores from existing relocated doors and reinstall in location as coordinated with Contractor.
3. New door locking hardware to be purchased and installed by contractor with removable Best cores to be shipped from manufacturer to Miami University Key Shop. Key shop to install cores.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop/coordination drawings/documents.

B. Doors and door hardware to be relocated to be reviewed by contractor prior to construction and coordinated as necessary with existing and new jambs including hinge locations and sizes.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Mounting heights for hardware from finished floor to center line of hardware item:
   1. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."

3.03 ADJUSTING

A. Adjust work under provisions of Section 01 7000.

B. Adjust hardware for smooth operation.

C. One Year Adjustment: Approximately one year after date of Final Acceptance, Installer shall perform the following:
   1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
   2. Consult with and instruct personnel on recommended maintenance procedures.
   3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.04 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01 7000.

B. Do not permit adjacent work to damage hardware or finish.

3.05 SCHEDULE - See drawings.

END OF SECTION

SECTION 09 2116

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal stud wall framing.

B. Gypsum wallboard.

C. Joint treatment and accessories.

1.02 RELATED SECTIONS

A. Section 06 1000 - Rough Carpentry.

B. Section 07 2100 - Thermal Insulation.

C. Section 07 9005 - Joint Sealers.

1.03 REFERENCES

A. AISI SG-971 - Specification for the Design of Cold-Formed Steel Structural Members; 1996, with 2000 Supplement.

B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2003.

C. ASTM C 475/C 475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002.

D. ASTM C 514 - Standard Specification for Nails for the Application of Gypsum Board; 2001.

E. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members; 2004.

F. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

G. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2002.

H. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2000.

I. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board; 2004.

J. ASTM C 954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2000.

K. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2001.

L. ASTM C 1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 1999.

M. ASTM C 1396/C 1396M - Standard Specification for Gypsum Board; 2003a.

N. ASTM D 3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2000.

O. ASTM E 413 - Classification for Rating Sound Insulation; 1987 (Reapproved 1999).

P. GA-214 - Recommended Levels of Gypsum Board Finish; Gypsum Association; 1996.

Q. GA-600 - Fire Resistance Design Manual; Gypsum Association; 2003.

1.04 SUBMITTALS

A. See Section 01 3300 – Submittal Procedures for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 QUALITY ASSURANCE

A. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.

B. Applicator Qualifications: Company specializing in performing gypsum board application and finishing, with minimum five (5) years of documented experience.

C. See Section 01 7700 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 METAL FRAMING MATERIALS

A. Metal Framing Manufacturers:
   1. Clark Steel Framing Systems: www.clarksteel.com.
   2. Dietrich Metal Framing: www.dietrichindustries.com.
   3. National Gypsum Company. www.nationalgypsum.com.
   4. USG: www.usg.com.

B. Metal Framing Connectors and Accessories:
   1. Same manufacturer as framing.
   2. The Steel Network Inc.: www.SteelNetwork.com.

C. Non-Loadbearing Framing System Components: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
   1. Studs: C shaped.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C shaped (if applicable).

D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI SG-971 Specification for the Design of Cold-Formed Steel Structural Members.
   2. Material: ASTM A 653/A 653M steel sheet, SS Grade 50, with G60/Z180 hot dipped galvanized coating.
   3. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings; specified in this section.
   4. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet or as limited by wall length.

2.02 GYPSUM BOARD MATERIALS

A. Manufacturers:
   1. G-P Gypsum Corporation: www.gp.com/gypsum.
   2. National Gypsum Company: www.nationalgypsum.com.
   3. USG: www.usg.com.

B. Gypsum Wallboard: ASTM C 1396/C 1396M. Sizes to minimize joints in place; ends square cut.
   1. Board for All Areas - Moisture & Mold Resistant
      a. Application: Surfaces for all locations unless noted otherwise
      c. Thickness: 5/8 inch, unless noted otherwise.
      d. Edges: Tapered and featured.
      e. Design Basis: Mold and Moisture Resistant Gypsum Board (Gold Bond® BRAND XP® Gypsum Board).

2.03 ACCESSORIES

A. Finishing Accessories: ASTM C 1047, galvanized steel or rolled zinc, unless otherwise indicated.
   1. Types: As detailed or required for finished appearance.
   2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead, L-bead, LC-bead, and J-bead at exposed panel edges.
   3. Architectural Z Shadow Bead Drywall Products - Trim Tex.

B. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.
   1. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
   2. Ready-mixed vinyl-based joint compound.

C. Screws:
   1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.
   2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

D. Control Joint:
   1. Zinc vertical control joint similar to Clark-Dietrich #093.

E. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Comply with ASTM C 754 and manufacturer's instructions.

B. Studs: Space studs as indicated.
   1. Extend partition framing to structure where indicated and to ceiling in other locations.
   2. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

D. Blocking: Install fire resistance material blocking for support of hardware and wall mounted

items. Comply with Section 06 1000 for wood

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. **Acoustic Insulation:** Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions. Prior to installing back-to-back metal studs, make sure acoustical insulation is installed.

B. **Acoustic Sealant:** Install in accordance with manufacturer's instructions.
   1. Place **one (1)** bead continuously on substrate before installation of wall base track members.
   2. Place **one (1)** continuous vertical bead between CMU substrate and all new metal stud members.
   3. In non-fire-rated construction, seal around all penetrations by conduit, pipe, ducts, and rough-in boxes. **Note that these penetrations in rated walls should be sealed with firestopping.**

3.04 GYPSUM BOARD INSTALLATION

A. Comply with ASTM C 840 and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
   1. Exception: Tapered edges to receive joint treatment at right angles to framing.

B. Single-Layer or Double-Layer Rated: Install gypsum board according to designated UL listed assembly requirement.

C. Installation on Metal Framing: Use screws for attachment of all gypsum board.

D. Install per indicated UL listed assemblies to achieve required fire resistance rated construction.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Corner Beads: Install at external corners, using longest practical lengths.

B. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.06 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.

B. Finish all gypsum board in accordance with GA-214 Levels.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
   2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.08 FINISH LEVEL SCHEDULE

A. Level 1: Above finished ceilings concealed from view.

B. Level 4: Walls and ceilings scheduled to receive flat or eggshell paint finish.

END OF SECTION

SECTION 09 5100

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:
   1. Acoustical ceiling panels.
   2. Exposed grid suspension system.
   3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

B. Related Sections:
   1. Section 09 2116 - Gypsum Board Assemblies

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
   3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
   4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
   6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
   7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
   8. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
   9. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
   10. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

1.4 SUBMITTALS

A. See Section 01 3300 – Submittal Procedures for submittal procedures.
B. Product Data: Submit manufacturer's technical data for type of acoustical ceiling unit and suspension system required.
C. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.
D. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.
E. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and

standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.

F. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the Associate's or Owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
   1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
      a. Flame Spread: 25 or less & Smoke Developed: 50 or less

C. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers (if applicable).

D. See Section 01 7700 - Closeout Submittals for additional warranty requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.7 PROJECT CONDITIONS

A. Space Enclosure:

   Standard Ceilings: Do not install interior ceilings until work area is nominally dry; work above ceilings is complete; and ambient conditions of temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.

1.8 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
   1. Acoustical Panels: Sagging and warping
   2. Grid System: Rusting and manufacturer's defects

B. Warranty Period Standard:
   1. Acoustical panels: Ten (10) years from date of substantial completion.Note Space Enclosure requirements
   2. Grid: Ten (10) years from date of substantial completion.

D. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent

with other warranties made by the Contractor under the requirements of the Contract Documents.

1.9 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
   1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 5.0 percent of amount installed.
   2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

Part 2-PRODUCTS

A.1 MANUFACTURERS

A. New Ceiling Panels: USG

2.2.0 NEW ACOUSTICAL CEILING UNITS

A. Acoustical Panels Type ACT-1:

   1. Manufacturer: USG
      a. Match existing non-tegular edge ceilings
   2. Color: White
   3. Size: 24in X 24in X 3/4in

B. Existing Acoustical Panels (To Be Matched): In areas where new work exists adjacent to existing work, match existing acoustical tiles and grid to existing. Coordinate with Associate to identify from MU records.

2.2.1 NEW SUSPENSION SYSTEMS

A. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized steel as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
   1. Structural Classification: ASTM C 635 Intermediate Duty.
   2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
   3. Acceptable Product: Donn DX/DXL15/16" Exposed Tee as manufactured by USG Interiors, Inc.

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire for Hangers and Ties: Hilti X-CW 12 ga ceiling wire assembly complying with ASTM A641.

D. Edge Moldings and Trim: Metal of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
C. In areas where existing ceilings are disturbed by new wall installation, remove ceiling materials and reinstall as required with same material. See drawings for areas where this applies.

3.3 INSTALLATION

A. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
B. Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.
C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
D. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.
B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 6500

RESILIENT BASE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient base.

1.02 REFERENCES

A. ASTM F 1861 - Standard Specification for Resilient Wall Base; 2002.

1.03 SUBMITTALS

A. See Section 01 3300 – Submittal Procedures for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Protect roll materials from damage by storing on end.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.06 EXTRA MATERIALS

A. Provide twenty five (25) lineal feet of base of type and color specified to match existing black cove base.

PART 2 PRODUCTS

2.01 MATERIALS - BASE

A. Resilient Base: ASTM F 1861, Type TS rubber, vulcanized thermoset base, in styles and colors as indicated on drawings and as follows:
   1. Manufacturers:
      a. Johnsonite, Inc: www.johnsonite.com.
      b. Substitutions: Not permitted
   2. Location/ Size: 4” as indicated on the drawings.

2.02 ACCESSORIES

A. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

B. Moldings, Transition Strips and Edge Strips: Rubber

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall surfaces are smooth and flat within tolerances specified in Section 09 2116, are dust-free, and are ready to receive resilient base.

3.02 PREPARATION

A. Clean substrate.

B. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 48 inches between joints.

B. Internal Cove Base Corners: Miter cut.

C. External Cove Base Corners: 'V' cut back of base strip to 2/3 of its thickness and fold.

D. Exposed Cove Base Ends: Use pre-molded units.

E. Install base on solid backing. Bond tightly to wall and floor surfaces.

F. Scribe and fit to door frames and other interruptions.

G. Install adhesive so bead does not read through the base material.

H. Base to be continued around casework bases, excluding single ¾" panel conditions. Coordinate with Associate.

3.04 CLEANING

A. Remove excess adhesive base and wall surfaces without damage.

END OF SECTION

SECTION 09 6516

RESILIENT TILE FLOORING

PART 1 - GENERAL

1.01 THIS SECTION INCLUDES

A. Flooring and accessories as shown on the drawings and schedules and as indicated by the requirements of this section.

1.02 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 sections) apply to the work of this section.

1.03 RELATED SECTIONS

A. Other Division 9 sections for floor finishes related to this section but not the work of this section.

1.04 QUALITY ASSURANCE AND REGULATORY REQUIREMENTS

A. Select an installer who is competent in the installation of Armstrong resilient tile flooring.

B. If required, provide types of flooring and accessories supplied by one manufacturer, including leveling and patching compounds, and adhesives.

C. If required, provide flooring material to meet the following fire test performance criteria as tested by a recognized independent testing laboratory:

1. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I.
2. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less.

1.05 SUBMITTALS

A. Submit shop drawings and manufacturer's technical data, installation and maintenance instructions for flooring and accessories.

B. Submit the manufacturer's standard samples.

1.06 ENVIRONMENTAL CONDITIONS

A. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.

B. Store materials in a clean, dry, enclosed space off the ground, and protected from the weather and from extremes of heat and cold. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

C. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65ºF (18ºC) and a maximum temperature of 100ºF (38ºC) for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55ºF (13ºC) in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.

D. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring.

1.07 WARRANTY

A. 5-Year Manufacturer’s Warranty.

PART 2 - PRODUCTS

2.01 RESILIENT TILE FLOORING MATERIALS

A. Provide Vinyl Composition Tile (VCT) Flooring manufactured by Armstrong, in color & style to match adjacent existing.
B. Armstrong Excelon (Confirm match with Mia mi University Project Manager and Associate prior to ordering.)
   1. ASTM F 1066 Class 2-Through Pattern, ISO 10595, Type II
   2. Thickness: 1/8”
   3. Size: 12”x12”
   4. Impact: ASTM F 1265
   5. Flame Spread: ASTM E 648 – 0.45 watt/cm2 or more Class I
   6. Smoke Evolution: ASTM E 662 – 450 or less

2.02 ADHESIVES

A. For Tile Installation System, Full Spread: Provide Resilient Tile Adhesive under the tile as recommended by manufacturer for these specific site conditions.

2.03 ACCESSORIES

A. For patching, smoothing, and leveling monolithic subfloors (concrete), provide Fast-Setting Cement-Based Underlayment, Fast-Setting Cement-Based Patch and Skim Coat, or Fast-Setting Cement-Based Patch and Underlayment per manufacturer’s recommendations for these specific site conditions.
B. Provide 1” wide resilient edge strips of equal gauge to the flooring, homogeneous vinyl or rubber composition, tapered edge, with color as selected by Design Associate.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
B. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
C. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
D. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.02 PREPARATION

A. Smooth concrete surfaces, removing rough areas, prior adhesives, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects with skim coat recommended by the flooring manufacturer.
B. Remove paint, varnish, oils, release agents, sealers, and waxes. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents.
C. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.

3.03 INSTALLATION OF TILE FLOORING

A. Install flooring in strict accordance with the latest edition of manufacturer's instructions. Refer to drawings for pattern requirements, if applicable.
B. Install flooring wall to wall, but before furniture, equipment, movable partitions, etc. Extend flooring into door recesses and similar openings.
C. Install flooring with orientation to match adjacent existing.
D. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, and pipes.
E. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

3.04 INSTALLATION OF ACCESSORIES

A. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed. See drawings for locations.

3.05 CLEANING AND PROTECTION

A. Perform initial maintenance according to the latest edition of manufacturer's instructions.
B. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.

END OF SECTION

SECTION 09 6813

TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile as supplied by Miami University and loose with full adhesion.

1.02 RELATED SECTIONS

A. Section 03 0130 - Resurfacing Concrete

B. Section 09 6500 - Resilient Base

1.03 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2006 (Reapproved 2011).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2010e1.

C. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 2011.

D. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.

E. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute; Current Edition.

F. CRI (GLC) - Green Label Testing Program - Approved Product Categories for Carpet; Carpet and Rug Institute; Current Edition.

G. CRI (GLP) - Green Label Plus Carpet Testing Program - Approved Products; Carpet and Rug Institute; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3300 – Submittal Procedures for submittal procedures.

B. Shop Drawings: Indicate layout of joints.

C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

D. Samples: Submit two (2) carpet tiles illustrating color and pattern design for carpet color selected.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.

2. Extra Carpet Tiles: Quantity equal to five (5) percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three (3) years documented experience.

B. Installer Qualifications: Company specializing in installing carpet with minimum three (3) years experience.

1.06 WARRANTY

A. Fifteen (15) Year Standard, Non-Prorated Warranty

B. See Section 01 7700 - Closeout Submittals for additional warranty requirements.

1.07 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. **Carpet - Interface**
   1. Product Number:
   2. Style: Cubic
   3. Color: "Construction"

B. Transition Strips
   1. Burke Flooring – Burke Indistries: www.burkeflooring.com/contact/
   2. Roppe

C. Other Acceptable Manufacturers:
   1. No Substitutions

2.02 MATERIALS

A. Carpet Tile Type CPT-1 (Per Drawings): Multi-level pattern loop eco 100% solution dyed nylon
   1. Product: Tufted Tip-sheared product manufactured by Interface.
   2. Tile Size: 19.69 in. x 19.69 in.
   3. Pile Thickness: 0.28 in.
   4. Pile Height: 0.17 in.
   5. Dye Method: 100% Solution Dyed
   6. Tufted Yard Weight: 24 oz/yd2
   7. Machine Gauge: 1/12 in.
   8. Pile Density: 5,574 oz/yd2
   9. Backing: Standard "GlasBac"

2.03 PERFORMANCE

A. Flooring Radiant Panel: ASTM E-648, Class 1

B. Smoke Density: ASTM E-662 </= 450

C. Lightfastness: AATCC 16-E >/= 4.0 @ 60 AFU's

D. Static: AATC-134 < 3.5 KV

2.04 ACCESSORIES

A. Adhesives: #2000 Adhesive - Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

B. VCT to Concrete Transition Strip:
   1. Similar to Burke Flooring Underslung Reducer 733 (Self-Stick) 735 (Dry Back) transitions strip.
   2. Similar to Roppe #172 Tile Reducer 1/8"

C. Carpet to VCT Transition Strip:
   1. Similar to Roppe Tile/Carpet Joiner

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

B. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
   1. Test in accordance with Section 09 0561.
   2. Test in accordance with ASTM F710.
   3. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Remove existing carpet tile and/or existing VCT in locations noted on the construction drawings.

B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler. If existing floor areas previously covered with VCT require adhesive sanding or liquid removals, proceed as necessary to meet manufacturer's recommendations.

C. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

D. Apply, trowel, and float filler to achieve smooth, flat, hard surface per manufacturer's recommendations. Prohibit traffic until filler is cured.

E. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet tile in accordance with manufacturer's instructions and CRI Carpet Installation Standard.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines. Match existing corridor carpet layout patterning.

F. Fully adhere carpet tile to substrate.

G. Adhere carpet tile to substrate along centerline of rooms, at perimeter of rooms, where tiles are cut, and at 15 foot intervals throughout rooms. Lay remainder of tile dry over substrate.

H. Adhere carpet tile as base finish up vertical surfaces to form base. Terminate top of base with cap strip.

I. Trim carpet tile neatly at walls and around interruptions.

J. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 9000

PAINTING AND COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, and other coatings.

C. Scope: Finish all interior surfaces exposed to view as noted on the drawings unless fully factory-finished and unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne, and lead items.

1.02 RELATED REQUIREMENTS

A. Section 06 2000 - Finish Carpentry

B. Section 09 2116 - Gypsum Board Assemblies

1.03 DEFINITIONS

A. Conform to ASTM D 16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D 16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2007.

C. ASTM D 4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 1992 (Reapproved 2003).

D. SSPC (PMI) – Good Painting Practice; SSPC Painting Manual, Vol. 1; Society for Protective Coatings; Fourth Edition.

1.05 SUBMITTALS

A. See Document 00 72 16 – General Requirements, Article 13 – Action Submittals for submittal procedures.

B. See Section 01 3300 – Submittal Procedures for submittal procedures.

C. Product Data: Provide data on all finishing products and special coatings, including VOC content.

D. Samples: Submit two (2) paper chip samples, 6 x 6 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.

E. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

F. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

G. Maintenance Materials: Furnish the following for Miami University's use in maintenance of project.
   1. Extra Paint and Coatings: one (1) gallon of each color, type, and surface texture; store where directed.
   2. Label each container with color, type, texture, and room locations in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum seven (7) years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum seven (7) years experience.

C. Warranty: All components of each finish product/system shall be protected against failure and/or performance deficiencies by a product manufacturer's installation and materials warranty. Said warranties shall be specific to each system required and shall be non-prorated warranties which guarantee against material and labor defects for a minimum period of five (5) years.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products from the same manufacturer to the greatest extent possible.

B. Paints:
   1. Basis of Design: **Porter PPG**: www.ppgporterpaints.com
   2. Approved Standard: PPG Porter – PPG paints. No other manufacturer shall be approved.
   3. Coating Systems:
      a. **Clear Finish Wood –** 2 coats stain, 1 coat sanding sealer, 2 coats waterborne polyurethane. Miami University approved products: 44500, 41060, 42786, and 42784.

b. **Opaque Finish Wood -** 1 coat primer, 2 coats semi-gloss enamel. Miami University approved products: 17-921, 90-1210, 90-474.
c. **Existing or Previously Varnished Wood** – Pre-clean, lightly sand and apply 2 coats Poly-Urethane satin or semi-gloss depending on required sheen level. Miami University approved products: 42786, 42784.
d. **New Gypsum Wallboard or Plaster** – 1 coat primer, 2 coat finish paint. Type of coating may vary due to project requirements. Miami University approved products: 17-921, 90-1210, 90-474, 9-500, 6-411, 6-500 and 9-300.
e. **Gypsum Wallboard where wall covering has been removed** – 1 coat Zinnser Guards damaged drywall sealer/primer or equal product, 2 coats finish paint. Miami University approved products: 17-921, 90-1210, 90-474, 6-411, 6-500, 9-300 and 9-500.
f. **Existing or Previously Painted Surfaces** – If Color is to remain the same then 2 coats of finish paint. If color is to be changed, 1 coat primer and 2 coats finish paint is required. Miami University approved products: 17-921, 90-1210, 6-411, 6-500, 9-300, 90-474 and 9-500.
g. **Metal Doors and Frames** - 1 coat primer, 2 coats semi-gloss enamel. Miami University approved products: 17-921, 90-912, 90-1210 and 90-474.
h. **Exposed Metal Conduits or Piping** – Finish the same as adjoining wall or ceiling surface.
i. **Dry Fall** – Finish upper areas in locations designated on the drawings.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed.
1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
4. Supply each coating material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Volatile Organic Compound (VOC) Content:
1. Provide coatings that comply with the most stringent requirements specified in the following:
a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
b. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org; specifically:
1. Opaque, Flat: 50 g/L, maximum.
2. Opaque, Nonflat: 150 g/L, maximum.
3. Opaque, High Gloss: 250 g/L, maximum.
4. Primers, Sealers and Undercoaters: 200 g/L., maximum
5. Floor Coatings: 100 g/L, maximum
6. Shellacs, Clear: 730 g/l, maximum
7. Shellacs, Pigmented: 550 g/L, maximum.
c. Architectural coatings VOC limits of State in which the project is located.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added

at project site; or other method acceptable to authorities having jurisdiction.

D. Flammability: Comply with International Building Code for surface burning characteristics.

E. Colors: Custom color to match existing adjacent color
   1. Test color match sample against adjacent walls, to be reviewed and approved by Miami University's Project Manager.

2.03 PAINT SYSTEMS

A. Interior Woodwork: Interior woodwork shall receive one coat of primer and two (2) coats of semi-gloss enamel.

B. Metal Doors and Frames: In addition to the shop coat of paint, metal doors and frames shall receive two (2) coats of semi-gloss enamel.

C. Gypsum Wallboard: Semi-gloss alkyd enamel shall be used for gypsum wallboard surfaces.

   1. New Wallboard: New wallboard shall receive one coat of primer and two (2) coats of finish.

   2. Existing Construction: Existing construction shall receive one (1) coat of primer and one coat of finish paint, except where old finish is removed to substrate.

D. Dry Fall upper room area where designated on the drawings including ceiling, walls, ductwork, electrical/data appurtenances and other items.

E. Exterior Metal: Exterior prime and two (2) coat painting of exposed metal lintels.

2.04 ACCESSORY MATERIALS

Miami University - Product Supplement
Painting Standards

INTERIOR APPLICATION

Areas of use	Products **PPG Porter Paints Painting Standard**
Primers (interior)	
All surfaces, new or previously painted, (except metal and masonry).	PPG Porter Paints 17-921 Seal Grip **(no product substitution will be accepted)**
Metal surfaces, new or previously painted.	PPG Porter Paints Low VOC Multi-Purpose Primer 7-282 PPG Porter Paints Pitt-Tech Primer 90-712 **(no product substitution will be accepted)**
Masonry, concrete, surfaces, new or previously painted.	PPG Porter Paints Pigmented Bonding Primer 4-809 PPG Porter Paints Seal Grip 17-921 PPG Porter Paints Acri Shield Bonding Primer 515 no product substitution will be accepted
Paint (interior)	
Ceilings / Ceiling Tiles	PPG Porter Paints SpeedHide Eggshell 6-411 **(no product substitution will be accepted)**
Metal surfaces Walls	PPG Porter Paints Pitt Tech Satin 90-474 **(no product substitution will be accepted)**

Trim	PPG Porter Paints Pitt Tech Satin 90-474 **(no product substitution will be accepted)**
Doors, Frames	PPG Porter Paints Pitt Tech Plus S/G 90-1210 **(no product substitution will be accepted)**

Stain (interior)

Trim, Case goods	PPG Porter Paints Oylmpic LO-VOC Stain 44500 **(no product substitution will be accepted)**

Varnish (interior)

Trim, Doors, Casegoods	PPG Porter Paints Interior Wateborne Satin Varnish 42786A **(no product substitution will be accepted)**

Caulk (interior)

Window casings, Door Casings, Trim	Guarantee. Color: White PPG Porter Paints Top Gun 200 1414”

Dry Fall Upper Level Room Surfaces

PPG SPEEDHIDE® Interior Dry-Fog Spray Paint Latex.

Primers (exterior)

Metal Windows, Doors & Frames new or previously painted.	**PPG Porter Paints Multi-Purpose Primer 7-282** **PPG Porter Paints Pitt-Tech Primer 90-712** Town & Ranch - Rust -Nox Alkyd Rust Inhibitive Primer Town & Ranch - Rust -Nox II Acrylic DTM Primer Benjamin Moore Acrylic Metal Primer (M04)

Paint (exterior)

Doors, Trim, Windows, wood or metal, and all previously painted wood surfaces	**PPG Porter Paints Acri-Shield S/G PP649** Town & Ranch Trim Lux Benjamin Moore Moorcraft Super Spec House & Trim (170)
Steel Grates, Handrails, Railings, Ladders, and building related misc. steel.	**PPG Porter Paints Pitt Thane Urethane 95-812**

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of coatings until substrates have been properly prepared, including

properly sanding and priming.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Design Associate of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Interior Wood: 15 percent, measured in accordance with ASTM D 4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing coatings that exhibit surface defects.

D. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Seal voids between pipe penetrations and wall surfaces before painting as indicated on the drawings.

G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finished coatings until completion of project.

B. Touch-up damaged coatings after Substantial Completion.

END OF SECTION

SECTION 10 1101
VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Markerboards and Map Rail Hooks

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and supports.

B. Section 09 2116 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.

B. ANSI A208.1 - American National Standard for Particleboard; 2009.

C. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2009a (Reapproved 2016).

D. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2012.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on markerboard, trim, and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations and special anchor details.

D. Samples: Submit color charts for selection of color and texture of markerboard, surfaces and trim.

E. Samples: Submit two samples 2 by 2 inch in size illustrating materials and finish, color and texture of markerboard, and trim.

F. Test Reports: Show conformance to specified surface burning characteristics requirements.

G. Manufacturer's printed installation instructions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five (5) year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Visual Display Boards:
   1. Marsh Industries: http://www.marsh-ind.com
   2. Basis of Design: Marsh Series 1400
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 VISUAL DISPLAY BOARDS

A. Markerboards: Porcelain enamel on steel, laminated to core.
   1. Color: White.
   2. ½" Substrate with mylar backer standard.

3. Size: As indicated on drawings.
4. Height: as indicated on drawings
5. Length: As indicated on drawings.
6. Frame: 1” extruded aluminum trim face with concealed fasteners.
7. Magnetic porcelain enameled steel surface
8. 1” Map Rail
9. L-clip installation.
10. Frame Finish: Anodized, natural.
11. Accessories: Provide 1 ¾” chalk tray and map rail.

2.03 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.

2.04 ACCESSORIES

A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories ; 1 inch wide overall , full width of frame.

B. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.

C. Chalk Tray: Aluminum , manufacturer's standard profile , one piece full length of chalkboard , molded ends, concealed fasteners, same finish as frame.

D. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

C. Verify flat wall surface for frameless adhesive-applied boards.

3.02 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Install with top of chalk tray at 30 inches above finished floor.

C. Secure units level and plumb.

D. Butt Joints: Install with tight hairline joints.

E. Carefully cut holes in boards for thermostats.

3.03 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at Date of Substantial Completion.

D. Break-in slate chalkboards with a chalk and clean treatment.

END OF SECTION

SECTION 10 2620

CORNER GUARDS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. 2" x 2" (76.2mm x 76.2mm) Corner Guards.

A.02 UBMITTALS
A. See Section 01 3300 – Submittal Procedures for submittal procedures.
B. Product Data: Submit manufacturer's product data.
C. Samples: Submit 6" long sample of each model and color specified for Associate's approval.
D. Certification: Submit manufacturer's certification indicating compliance with ADA requirements.

1.03 QUALITY ASSURANCE
A. Comply with NFPA 101 for interior finish materials. Smoke developed less than 450 and flame spread of 25 or less in accordance with ASTM E 84.
B. See Section 01 7700 - Closeout Submittals for additional warranty requirements.

1.04 DELIVERY, STORAGE, AND HANDLING
A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging with labels clearly indicating manufacturer and material.
B. Storage: Store materials indoors in a clean, dry area protected from damage and in accordance with manufacturer's instructions.
C. Handling: Protect materials during handling and installation to prevent damage.

PART 2 PRODUCTS

2.01 MANUFACTURER
A. InPro Corporation, www.inprocorp.com
B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CORNER GUARD SYSTEMS
A. Corner Guard System: Surface Mounted Stainless Steel
   1. Stainless Steel Corner Guard Profile
   2. 1 1/2" (51mm) x 1 1/2" (51mm), 90 degree
   3. 7' (2.44m) height to start immediately above rubber base.

2.03 MATERIALS
A. Type 430, 16 Gauge
B. Finish: No. 4 satin finish

2.04 COMPONENTS
A. Cement-on

2.05 LOCATION
A. As indicated on the drawings.

PART 3 EXECUTION

3.01 EXAMINATION
A. Inspect wall surfaces to receive corner guards. Notify the Design Associate if wall surfaces are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. Install corner guard at exterior corner location where indicated on the drawings.
B. Install corner guard to walls securely in accordance with manufacturer's written instructions.
C. Install corner guards accurately in alignment, and elevation.

END OF SECTION

PLUMBING SPECIFICATIONS

INDEX

SECTION 22 00 00

PLUMBING GENERAL

PART 1 GENERAL

1.01 REFERENCE

A. Sections 22 00 00 through 22 06 00 (as included), for items of a general nature which apply to the Plumbing Contract, unless indicated otherwise herein.

B. Sections 22 07 19 through 22 40 00 (as included), cover Plumbing work specifically.

C. Applicable Division 1 and General Conditions terms and conditions (if any).

D. Applicable construction codes, standards and guidelines for all Plumbing Contract elements, including but not limited to the following:

1. City of Oxford, Ohio Building Code, including Plumbing, Fuel Gas, Mechanical, handicap accessibility and energy conservation portions thereof.

2. City of Oxford Board of Health.

3. State of Ohio Environmental Protection Agency (E.P.A.).

4. NFPA pamphlet no. 70, NATIONAL ELECTRIC CODE

5. City of Oxford Division of Water utility provider.

6. City of Oxford Sewer and Drain authority.

7. American National Standards Institute (ANSI) standards for materials and construction.

8. American Society of Mechanical Engineers (ASME) standards for materials and construction.

9. American Society of Sanitary Engineering (ASSE) standards for performance and testing.

10. American Society for Testing and Materials (ASTM) standards for materials, construction and testing.

11. American Water Works Association (AWWA) standards for materials, construction and disinfection procedures.

12. National Sanitation Foundation (NSF) standards for materials and construction.

13. Cast Iron Soil Pipe Institute (CISPI) standards for materials and construction.

14. Underwriter's Laboratories (UL) standards for materials and construction.

15. The manufacturer's installation guidelines and recommendations for individual items, elements and/or systems indicated herein.

16. The Owner's material and installation guidelines and/or standards.

1.02 SCOPE

A. This Contractor shall furnish all labor, materials, tools, incidentals, details, etc., necessary to provide a complete, operational and approved Plumbing System, including but not limited to all items and elements described in the Plumbing Specification and shown on the Plumbing Drawings, and as required for coordination and/or interface with work under separate contract as indicated by complete construction documentation package.

B. The Plumbing Contractor is responsible for satisfactorily addressing all review and inspection authorities' requirements and directives in regard to methods of installation necessary for final approval.

1.03 PERMITS AND FEES

A. Unless directed otherwise by the General Conditions portion of project documentation, the Plumbing Contractor shall apply for and pay any review, inspection, permit, license, testing and/or other service fees required by all review/inspection/approval authorities in connection with the work under this Contract.

B. Unless directed otherwise by the General Conditions portion of project documentation, the Plumbing Contractor shall apply for and pay any procurement, tap, capacity, metering, testing and/or other service fees required by all Utility Providers (Water, Gas, Storm, Sewer etc.) in connection with the work under this Contract. This shall include procurement, execution and return of any forms and/or applications required; and participation in individual, initial design/installation consultations with the providers if required.

1.04 PLUMBING UTILITY CONNECTIONS FOR ITEMS OR ELEMENTS NOT INCLUDED IN THE PLUMBING CONTRACT

A. Provide Plumbing supply, waste, drain, vent, and any other piped utilities included for the project as required, as listed herein, and/or as shown on the Plumbing Drawings for items furnished and/or installed under separate contract requiring same. These items shall include, but not be limited to the following:

1. HVAC equipment; final connection (where applicable) by the HVAC Contractor.

2. Owner provided items; final connection (where applicable) by the Plumbing Contractor.

B. Rough-in Plumbing supply, waste, drain, vent, and any other piped utilities included for the project as required, as listed herein, and/or as shown on the Plumbing Drawings for all future items requiring same.

1.05 Concrete housekeeping and support pads for equipment in the Plumbing Contract are the responsibility of the Plumbing Contractor. Concrete pad construction to be in accordance with specifications provided in the General Contract for same.

PART 2 PRODUCTS

2.01 Where items/elements are indicated herein to be listed/approved, the intent of this specification is that said item/element shall be listed by all applicable material/construction standards and subject to final approval (including methods of installation) by all review/inspection/approval authorities.

2.02 Unless indicated otherwise, all plumbing contract items/elements (pipe, fittings, valves, specialties, fixtures, equipment, etc.) materials, construction, performance, testing and methods of installation to be as listed/approved by all applicable material/construction/installation standards for same, and be in accordance with the requirements of all review/inspection/approval authorities. This includes, but is not limited to, the standards and authorities referenced in this specification. In the absence of such standards and/or requirements, the item/element manufacturer's recommendations, as confirmed by the Plumbing Contractor in advance, shall be followed.

2.03 Unless indicated otherwise, all Plumbing piping shall be in accordance with the following standards in regard to materials, construction, dimensions/tolerances, type of service/transmission medium (water, air, gas, etc,) and methods of installation (as applicable), and shall be so listed. Final approval for use is subject ot the requirements of the review and inspection authorities:

A. Steel pipe, steel, malleable and cast iron fittings and joining methods; per applicable ASTM/ANSI/ASME standards. In addition, where utilized for potable water service, all elements shall be per applicable NSF and ASTM A53 (for carbon steel) standards.

B. Ductile iron pipe, fittings and joining methods; per applicable ASTM/ANSI/ASME/AWWA/NSF standards.

C. Plastic pipe, fittings and joining methods; per applicable ASTM/ANSI/ASME/AWWA/NSF standards.

D. Cast iron pipe, fittings and joining methods; per applicable ASTM/ANSI/ASME/CISPI standards.

E. Copper/copper alloy/brass pipe/tube, fittings and joining methods; per applicable ASTM/ANSI/ASME standards. In addition, where utilized for potable water service, all elements shall be per applicable NSF standards.

2.04 All Plumbing Contract items/elements shall have the manufacturer's mark or name and the quality of the product or identification of same cast, embossed, stamped or indelibly marked on each item/element in accordance with the standards under which they are accepted and approved per applicable code(s).

2.05 PLUMBING UTILITY CONNECTIONS PROVIDED FOR ITEMS OR ELEMENTS NOT INCLUDED IN THE PLUMBING CONTRACT

A. Unless indicated otherwise, the Plumbing Contractor shall furnish and install all traps and stops (as applicable) as required for items furnished under separate contract. This includes items with connections by the Plumbing Contractor or with connections under separate contract.

B. Unless indicated otherwise, Fixture traps above floor slab connected to the sanitary waste system shall be cast brass P-traps with integral cleanout. P-traps below floor slab to be cast iron, less cleanout. See plans for sizes.

C. Unless indicated otherwise, Fixture traps connected to waste or drain systems other than the sanitary waste system shall be of same material and connection type as the associated piping system. P-trap or S-trap to be provided as indicated on plans.

D. Unless indicated otherwise, All waste and drain rough-ins for future shall terminate with a short nipple and cap and no trap.

E. Unless indicated otherwise, Supply rough-ins to be furnished with accessible shut-offs at connection points. Shut-offs at supply rough-ins for fixtures (sinks, lavatories, etc.) to be angle type compression stops. Shut-offs at supply rough-ins for equipment or other elements to be in-line valves as specified for individual services. All supply rough-ins for future shall terminate with a short nipple and cap immediately downstream of the shut-off.

F. Unless indicated otherwise, where connection elements described herein are exposed in locations other than restricted access utility or maintenance areas, all metallic components to be furnished with a polished chrome finish. Wall or other structure piping penetrations at these locations to be provided with polished chrome finish escutcheons.

PART 3 EXECUTION

3.01 Where standards, codes or guidelines are referenced herein and throughout the Plumbing Contract documentation, including plans and specifications, the latest version/edition shall be applied, unless the Building Code references another version/edition, which shall take precedence.

3.02 Refer to project documentation furnished with the complete construction package in advance of work for overall coordination and verification of requirements at work of other trades relating to, interfacing with, and/or impacting work in the Plumbing Contract. This includes exact locations, quantities, physical sizes, rough-in details, pipe routing, connection sizes, etc., for items included both in the Plumbing Contract and under separate contract. Coordinate installation and interface requirements with the appropriate contractor(s) in advance of work.

3.03 Include any minor details, items and/or elements essential to necessary approvals and successful operation in addition to the items specified herein and shown on plans.

3.04 See general "PLUMBING NOTES" on plans for additional conditions and requirements relative to the Plumbing Contract.

3.05 Plumbing items and elements shall be installed with due regard to preservation of the strength of structural members and prevention of damage to walls, surfaces and other structures through installation, bearing support or subsequent usage of Plumbing items and elements. No framing or other support structure shall be cut, notched or bored in excess of limitations specified in the Building Code, or by the manufacturer of the framing or other support structure, as confirmed in advance of work by the Plumbing Contractor.

END OF SECTION

SECTION 22 01 05

PLUMBING GENERAL PROVISIONS

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Furnish all labor, materials, tools, incidentals and details necessary to provide a complete mechanical system, ready to operate, including but not limited to the items listed under the Mechanical Specification Indexes.

B. Include any minor details essential to successful operation and any other items specified or shown on the Drawings.

C. The Contractor is required to read the Specifications covering all branches of the work and will be held responsible for coordination of his work with work performed under all other Contracts.

D. The Contractor is required to visit the site and fully inform himself concerning all conditions affecting the scope of his work. Failure to visit the site shall not relieve the Contractor from any responsibility in the performance of his Contract.

E. The Contractor should feel free to contact the Architect immediately if there is any question regarding the meaning or intent of either Plans or Specifications, or if he notices any discrepancies or omissions in either Plans or Specifications.

F. Other than minor adjustments shall be submitted to the Architect for approval before proceeding with the work.

G. The Contractor shall submit on his letterhead, along with the Bid, the manufacturer's name and the names of all Subcontractors to whom he intends to sublet the work. If the Contractor fails to provide this information with the Bid, the Owner shall have the right to select the manufacturers and Subcontractors with no additional charge.

H. Scheduling of all work performed by this Contractor shall be completely coordinated with the Construction Manager.

I. This Contractor shall furnish to Architect a written description of procedure on this job including scheduling of the work to be done for his approval. This shall be submitted within 10 days after the Contract is awarded. There shall be six (6) copies.

J. All material hoisting by trade involved.

K. Arrangements for storage of tools and material, removal of debris, and interruptions of services shall be made with the Construction manager.

L. Extreme care shall be taken to avoid interference and/or conflict with work of other trades. Consult with the Architect regarding any points where interference and/of conflict is likely to occur and follow dimensions carefully where given on the Drawings. Pay particular attention to minimum clear heights when indicated on the Drawings.

M. It is mandatory that dust and debris be held to a minimum. This Contractor shall provide drop cloths, screens, curtains, etc., to protect all equipment and personnel from dust and dirt during the course of his work. All damage to existing construction or finishes shall be repaired by this Contractor upon removal of dirt and dust protection devices. All dirt, dust and other protection devices shall be approved by the Construction Manager before any work is started in the area involved.

N. The Contractor, insofar as this Contract is concerned, shall at all times keep the premises and the building in a neat and orderly condition.

O. At the completion of the project, this Contractor shall promptly clean up and remove from the site, all debris and excess materials.

1.02 DRAWINGS

A. Consult all Contract Drawings which may affect the locations of any equipment, apparatus, piping and ductwork and make minor adjustments in location to secure coordination.

B. Piping and duct layout is schematic and exact locations shall be determined by structural and other conditions and verified in the field. This shall not be construed to mean that the design of the system may be changed, it refers only to the exact location of piping and ductwork to fit into the building as constructed, and to coordination of all work with piping and equipment included under other Divisions of the Specifications.

C. The layout shown on the Drawings is based on a particular make of equipment. If another make of equipment is used which requires modifications or changes of any description from the Drawings or Specifications, this Contractor shall be responsible for making all such modifications and changes, including those involving other trades, as a part of this Contract and the cost thereof shall be included in his Bid. In such case, the Contractor shall submit Drawings and Specifications showing all such modifications and changes prior to starting work, which shall be subject to the approval of the Architect.

D. The Owner and Architect reserves the right to make minor changes in the location of piping and equipment up to the time of rough-in without additional cost to the Owner.

E. Where certain grades and/or elevations are given on the Drawings, they have been obtained from the best information available; however, they are not guaranteed. This Contractor MUST assume the full responsibility of verifying

present elevations in the field and making any adjustments as may be necessary, all of which must be included in his Bid Price.

F. Due to the scale of the Drawings, it is impossible to show all offsets and transitions which may be required. This Contractor shall carefully investigate the conditions affecting all work and shall furnish all elbows, fittings, transitions, etc., required to accomplish the desired result at no additional cost to the Owner.

G. Install all work as close as possible to walls, ceilings, struts, members, etc., consistent with the proper space for covering, access, etc., so as to occupy the minimum of space.

H. Actual dimensions shown on the Drawings and field dimensions shall take precedence over scaled dimensions.

1.03 PERMITS, INSPECTIONS AND CODES

A. The Architect will obtain the general building permit. Any other permits required for the project will be obtained by the Contractor performing the work. Fees will be included in the bid price.

B. Completed installations shall conform with all applicable Federal, State and Local Laws, Codes and Ordinances, including but not limited to the latest editions of the following:

1. Ohio Building Code, State of Ohio.

2. A.S.M.E. Pressure Piping Code - Section B31.1

3. National Electrical Code, Bulletin No. 70, National Fire Protection Association.

4. Life Safety Code, Bulletin No. 101, National Fire Protection Association.

C. Nothing contained in the Plans and Specifications shall be construed to conflict with these laws, codes and ordinances and they are hereby made a part of these Specifications.

1.04 OHIO ENERGY CODE

A. The Mechanical System must comply with all requirements of the State of Ohio "Code for Energy Conservation". This includes, but is not limited to, efficiencies, power factors, insulation thickness, etc.

1.05 UTILITIES

A. The Contractor shall investigate and locate all utilities prior to construction.

B. Each Contractor is responsible for rerouting or replacing existing utilities where necessary to permit installation of his work.

C. Support, protection and restoration of all existing utilities and appurtenances shall be the responsibility of the Contractor. The cost of this work shall be included in the price bid for the various items.

D. The Contractor shall cause notice to be given to the Ohio Utilities Protection Service (telephone 800-362-2764 - toll- free) and to the Owners of underground utility facilities shown on the plans who are not members of a registered underground protection service in accordance with Section 153.64 of the Revised Code. The above mentioned notice shall be given at least 48 hours, excluding Saturdays, Sundays and legal holidays, prior to commencing work.

E. The Contractor shall alert immediately the occupants of nearby premises as to any emergency that he may create or discover on or near such premises of the underground facility, any break or leak on its lines or any dent, gouge, groove or other damage.

1.06 OPERATING AND MAINTENANCE INSTRUCTIONS

A. This Contractor shall thoroughly instruct and supervise the Owner's Maintenance Personnel in the proper operation and maintenance of the mechanical system equipment. This Contractor shall be responsible for arranging for the instruction and supervision at a time convenient to the Owner and notifying the Architect of the time at least 48 hours in advance.

Instructions shall include the following:

1. Location of equipment and explanation of what it does.

2. Reference to "Operating Instruction Manuals" for record and clarity.

3. Coordination of written and verbal instruction so that each is understood by all personnel.

4. Specific maintenance to be performed by the Owner.

B. Furnish one (1) copy of the printed Operating and Maintenance Instructions for the Mechanical Systems for review. Copy shall be neat, legible and bound in a hardback 3-ring notebook. After final approval, provide four (4) copies of Operation and Maintenance Instructions for submittal to the Owner. Instructions shall consist of the following items:

1. Title Page: Title of Project, address, date of submittal, name and address of Contractor, name of Architect.

2. Second Page: Index of Manual Contents.

3. First Section: A copy of each approved shop drawing and submittal with an index at the beginning of the section.

4. Second Section: A list of all equipment used on the project, together with supplier's name and address.

5. Manufacturer's maintenance manuals for each item of equipment furnished under this contract. Manuals shall include such items as parts list, detailed lubrication instructions, procedures for performing normal maintenance functions, preliminary trouble shooting procedures and wiring diagrams.

6. Complete wiring diagrams for the plumbing systems as actually wired including control and interlock wiring.

7. Brief but complete instructions for start-up, shut- down and routine maintenance of each system.

8. Routine and 24-hour emergency information:

   a. Name, address and telephone number of servicing agency.

   b. Include names of personnel to be contacted for service arrangements.

C. Frame one (1) copy of brief start-up, shut-down and routine maintenance instructions and complete system wiring diagrams under glass and mount on the Equipment Room wall.

1.07 RECORD DOCUMENTS

A. The Contractor shall keep an accurate record of all deviations from Contract Drawings and Specifications. He shall neatly and correctly enter in colored pencil any deviations on Drawings affected and shall keep the Drawings available for inspection. Extra sets of Drawings will be furnished for this purpose.

B. At the completion of project and before final approval, make any final corrections to Drawings and certify to the accuracy of each print by signature and deliver same to Architect

1.08 SUPERVISION

A. This Contractor shall have in charge of the work, on the job during construction, a competent superintendent experienced in the work installed under this Contract.

1.09 UNACCEPTABLE WORK AND OBSERVATION REPORTS

A. Work shall be unacceptable when found to be defective or contrary to the Plans, Specifications, Codes specified or accepted standards of good workmanship.

B. The Contractor shall promptly correct all work found unacceptable by the Architect and/or Construction Manager or the Owner whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such unacceptable work, including compensation for the Architect's or the Construction Manager's additional services made necessary thereby.

C. During the course of construction, the Architect will prepare "Observation Reports" with a list of items found to be in need of correction. All items listed shall be corrected by the Contractor. A space is provided on the form for the Contractor to note the completion of each item. All prior "Observation Report" items must be completed, the lists signed and returned to the Architect prior to making the final inspection. After the final list is issued, the same procedure will apply.

1.10 FINAL INSPECTION

A. When the Contractor determines all work is completed and working properly per the Contract Documents, he shall request a "final" inspection by the Architect in writing. If more than one reinspection is required after this final inspection, the Contractor shall bear all additional costs including compensation for the Architect's additional services made necessary thereby.

B. As part of the final checkout of the project, the Architect will be checking out the operation of the various systems. This Contractor shall provide such assistance as required (including manpower and tools) to start and stop the various systems, open and close valves etc. The Contractor (not the Architect) is responsible to turn on the systems and demonstrate they are operating properly.

1.11 GUARANTEE

A. This Contractor is responsible for all defects, repairs and replacements in materials and workmanship, for a period of one (1) year after final payment is approved by the Architect.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 22 05 17

FIRESTOPPING

PART 1 GENERAL

1.01 SCOPE

A. Each Contractor shall be responsible for firestopping around all openings for pipes, ducts, conduits, etc., installed by him at all fire walls and smoke walls. Firestopping shall be performed by an installer who has been trained by manufacturer, or manufacturer's representative, in the installation procedures based on published UL tested fire stop systems.

1.02 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.03 REFERENCE

A. Division 1 – General Conditions
B. Division 3 – Concrete
C. Division 4 – Masonry
D. Division 9 – Finishes
E. Section 22 05 16 – Sleeves and Collars

1.04 GENERAL REQUIRMENTS

A. Test Requirements: ASTM E-814, "Standard Method of Fire Tests of Through Penetration Fire Stops" (July 1997).

B. Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

1. UL Fire Resistance Directory:

a. Through-Penetration Firestop Devices (XHCR)
b. Fire Resistance Ratings (BXUV)
c. Through-Penetration Firestop Systems (XHEZ)
d. Fill, Voids, or Cavity Material (XHHW)
e. Forming Materials (XHKU)

C. International Firestop Council Guidelines for Evaluating Firestop Systems Associating Judgments

D. ASTM E-84, Standard Test Method for Surface Burning Characteristics of Building Materials.

E. The Ohio Building Code (OBC)

F. NFPA 101 - Life Safety Code

1.05 QUALITY ASSURANCE

A. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

B. Firestop System installation must meet requirements of ASTM E-814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

E. For those firestop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council (September 7, 1994).

1.06 SUBMITTALS

A. Submit Product Data: Manufacturer’s specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions.

B. Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineer judgment must include both project name and contractor’s name who will install firestop system as described in drawing.

C. Submit material safety data sheets provided with product delivered to job-site.

1.07 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training

to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.09 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Scheduling

1. Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

2. Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 PRODUCTS

2.01 FIRESTOPPING, GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the

firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that is needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Hilti, Inc., Tulsa, Oklahoma, (800)879-8000
2. Tremco Sealants & Coatings, Beachwood, Ohio, (216) 292-5000
3. 3M Fire Protection Products, St. Paul, Minnesota, (612) 736-0203

2.03 MATERIALS

A. Use only firestop products that have been UL 1479, ASTM E-814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Cast-in place firestop devices are installed prior to concrete placement for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors, the following products are acceptable:

1. Hilti CP 680 Cast-In Place Firestop Device
2. Fox Coupling, Inc. "Cast-In-Place Firestop Coupling".
3. Proset Cast-In-Place Device

C. Sealant or caulking materials for use with non-combustible items including steel pipe & copper pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant
2. 3M Fire Barrier CP25 or Firestop Sealant 2000
3. Tremco Fyre Shield

D. Sealant or caulking materials for use with sheet metal ducts, the following products are acceptable:

1. Hilti CP 601S Elastomeric Firestop Sealant or CP 606 Flexible Firestop Sealant
2. Tremco Fyre-Shield High Performance Ceramic Firestop Sealant
3. 3M Fire Barrier CP25WB+ or 2000 Silicone Sealant

E. Intumescent sealant or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe and plastic pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant
2. 3M Fire Barrier CP25WB+
3. Tremco Intumescent Acrylic or TremStop WBM

F. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti CP 642 and CP643 Firestop Collar, CP645 Wrap Strip
2. Tremco TREMstop D Combustible Pipe Intumescent Device System and TremStop WS Wrap Strip
3. 3M Ultra Plastic Pipe Device and Fire Barrier FS-195+ Wrap Strip

G. Materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 635 Trowelable Firestop Compound and FS 657 FIRE BLOCK
2. Tremco TremStop M Fire Rated Mortar and PS Pillows
3. 3M Fire Barrier CS-195+ Composite Sheet

H. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 657 FIRE BLOCK
2. Tremco PS Firestop Pillows
3. 3M CS Intumescent Sheet

I. Provide a firestop system with an "F" Rating as determined by UL 1479 or ASTM E814. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated.

PART 3 EXECUTION

3.01 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.

2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.03 INSTALLATION

A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.

1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

2. Consult with the Owner’ Representative and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

3. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas. All penetrations are to be labeled in accordance with the Architect’s standard labeling system. The HVAC Contractor shall coordinate all fire stopping requirements with the Architect/Construction Manager prior to start of work.

B. Keep areas of work accessible until inspection and approval have been completed.

C. All fire stopping shall be inspected and approved by a licensed independent Consultant. All unapproved fire stopping products installed by this contractor will be removed and replaced at his expense.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

3.05 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

END OF SECTION

SECTION 22 05 94

PROTECTION AND CLEANING

PART 1 GENERAL

Not Applicable

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 Protect all mechanical equipment against damage from any cause whatsoever and pay the cost of replacing and repairing equipment made necessary by failure to provide suitable protection.

3.02 After all piping and equipment has been approved and after all plastering has been completed, bare piping and insulation provided under this Contract shall be thoroughly cleaned of dirt, grease, rust and oil.

3.03 Repair all dents and scratches in factory prime or finish coats on all mechanical equipment to the satisfaction of Associate. If damage is excessive, replacement may be required.

3.04 Flush out all piping systems to remove all dirt and grease from pipes and equipment before systems are placed in operation.

3.05 Cover all pumps, open pipes, etc., to keep out dirt, water and weather during construction.

3.06 This Contractor shall clean up and remove all debris from the site and shall at all times keep the premises in a neat and orderly condition.

END OF SECTION

SECTION 22 05 97

REMODELING

PART 1 GENERAL

1.01 REFERENCE

A. Division 1 - GENERAL REQUIREMENTS
B. Section 22 05 98 - DEMOLITION

1.02 SCOPE

A. This Contractor shall include the remodeling of and additions to all mechanical work in the areas indicated on the Architectural and Mechanical Drawings and in all areas shown on the Drawings. All necessary or required remodeling or additions to the present mechanical work shall be included in this Contract, as indicated or required, to the end that the work will result in the finished remodeled spaces shown on the Architectural Drawings.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 In all of the remodeling work the mechanical work shall follow the intent of the Mechanical Specification insofar as possible with regard to material and workmanship.

3.02 Where old walls and furrings are removed, exposed piping that will remain in use shall be offset to the nearest available new wall or concealed space and reconnected as necessary or required, using all new material. Note that this shall include piping of every description at both known and unknown locations.

3.03 All piping installed in the remodeling work shall be installed as concealed work. This Contractor shall do all cutting required.

3.04 Existing plumbing fixtures that are to remain but which interfere with the remodeling work of any Contractor shall be removed and replaced later when directed.

END OF SECTION

SECTION 22 05 98

DEMOLITION

PART 1 GENERAL

1.01 REFERENCE

A. Section 22 05 97 - REMODELING

1.02 SCOPE

A. The General Contractor shall be responsible for all plumbing demolition in all areas that will be renovated as part of this project. The plumbing contractor shall be responsible for equipment disconnects and coordination with the general contractor to identify the equipment, piping, etc that is to be removed.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

HVAC SPECIFICATIONS

INDEX

SECTION 23 01 05

HVAC GENERAL PROVISIONS

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Furnish all labor, materials, tools, incidentals and details necessary to provide a complete mechanical system, ready to operate, including but not limited to the items listed under the Mechanical Specification Indexes. The scope of work summary is as follows:

1. The existing return air tracking VAV box for the Lecture Hall shall be removed. The box will be replaced with a sheetmetal transition piece with a manual balance damper.

2. Existing pneumatically controlled VAV box serving the Lecture Hall will be replaced. New boxes will be DDC controlled variable air volume type with hot water terminal reheat.

3. Existing air devices will be replaced. Limited low pressured sheetmetal modifications will be required in each room as shown on the drawings.

4. Existing finned radiation will be re-piped and new DDC control valves will be installed such that the finned radiation and the VAV box for the Lecture Hall are controlled together.

5. VAV box in the Lecture Hall shall be controlled through the occupancy sensor installed for lighting control. The box shall be indexed to the unoccupied position when the room is unoccupied.

B. Include any minor details essential to successful operation and any other items specified or shown on the Drawings.

C. The Contractor is required to read the Specifications covering all branches of the work and will be held responsible for coordination of his work with work performed under all other Contracts.

D. The Contractor is required to visit the site and fully inform himself concerning all conditions affecting the scope of his work. Failure to visit the site shall not relieve the Contractor from any responsibility in the performance of his Contract.

E. The Contractor should feel free to contact the A/E immediately if there is any question regarding the meaning or intent of either Plans or Specifications, or if he notices any discrepancies or omissions in either Plans or Specifications.

F. Other than minor adjustments shall be submitted to the A/E for approval before proceeding with the work.

G. The Contractor shall submit on his letterhead, along with the Bid, the manufacturer's name and the names of all Subcontractors to whom he intends to sublet the work. If the Contractor fails to provide this information with the Bid, A/E shall have the right to select the manufacturers and Subcontractors with no additional charge.

H. Scheduling of all work performed by the Contractor shall be completely coordinated with University.

I. All material hoisting by trade involved.

J. Arrangements for storage of tools and material, removal of debris, and interruptions of services shall be made with University.

K. All connections to, or revisions in, existing piping or facilities shall be done at such time as agreed to by the University and all work shall be scheduled as required under "General Conditions". Revisions to the existing piping systems must be done with the minimum of shutdown time. All piping shall be run to the point of new connections and new equipment installed and ready to operate before any connections are to be made.

L. Extreme care shall be taken to avoid interference with University's equipment, especially in the existing portion of the building. Consult with the A/E regarding any points where interference is likely to occur and follow dimensions carefully where given on the Drawings. Pay particular attention to minimum clear heights when indicated on the Drawings.

M. It is mandatory that dust and debris be held to a minimum. The Contractor shall provide drop cloths, screens, curtains, etc., to protect University equipment and personnel from dust and dirt during the course of his work. All damage to existing construction or finishes shall be repaired by the contractor upon removal of dirt and dust protection devices. All dirt, dust and other protection devices shall be approved by University before any work is started in the area involved.

N. The Contractor, insofar as this Contract is concerned, shall at all times keep the premises and the building in a neat and orderly condition. This includes using a vacuum cleaner in the office and classroom areas.

O. At the completion of the project, the contractor shall promptly clean up and remove from the site, all debris and excess materials.

1.02 DRAWINGS

A. Consult all Contract Drawings which may affect the locations of any equipment, apparatus, piping and ductwork and make minor adjustments in location to secure coordination.

B. Piping and duct layout is schematic and exact locations shall be determined by structural and other conditions and verified in the field. This shall not be construed to mean that the design of the system may be changed, it refers only to the exact location of piping and ductwork to fit into the building as constructed, and to coordination of all work with piping and equipment included under other Divisions of the Specifications.

C. The layout shown on the Drawings is based on a particular make of equipment. If another make of equipment is used which requires modifications or changes of any description from the Drawings or Specifications, the Contractor shall be responsible for making all such modifications and changes, including those involving other trades, as a part of this Contract and the cost thereof shall be included in his Bid. In such case, the Contractor shall submit Drawings and Specifications showing all such modifications and changes prior to starting work, which shall be subject to the approval of the A/E.

D. The A/E reserves the right to make minor changes in the location of piping and equipment up to the time of rough-in without additional cost to University.

E. Where certain grades and/or elevations are given on the Drawings, they have been obtained from the best information available; however, they are not guaranteed. The Contractor MUST assume the full responsibility of verifying present elevations in the field and making any adjustments as may be necessary, all of which must be included in his Bid Price.

F. Due to the scale of the Drawings, it is impossible to show all offsets and transitions which may be required. The Contractor shall carefully investigate the conditions affecting all work and shall furnish all elbows, fittings, transitions, etc., required to accomplish the desired result at no additional cost to University.

G. Install all work as close as possible to walls, ceilings, struts, members, etc., consistent with the proper space for covering, access, etc., so as to occupy the minimum of space.

H. Actual dimensions shown on the Drawings and field dimensions shall take precedence over scaled dimensions.

1.03 PERMITS, INSPECTIONS AND CODES

A. The Contractor shall file all Drawings, pay all necessary charges and fees, and obtain all necessary permits and certificates of inspection relative to his work.

B. Completed installations shall conform with all applicable Federal, State and Local Laws, Codes and Ordinances, including but not limited to the latest editions of the following:

1. Ohio Building Code, Department of Industrial Relations, State of Ohio.

2. Specific Safety Requirements Relating to Building and Construction Work, Industrial Commission and Department of Industrial Relations, State of Ohio.

3. Specific Safety Requirements Covering the Installation of Pressure Piping Systems, Industrial Commission and Department of Industrial Relations, State of Ohio.

4. Ohio Pressure Piping Systems Rules, Ohio Board of Building Standards and Department of Industrial Relations, State of Ohio.

5. A.S.M.E. Pressure Piping Code - Section B31.1

6. National Electrical Code, Bulletin No. 70, National Fire Protection Association.

7. Air Conditioning and Ventilating, Bulletin No. 90 A, National Fire Protection Association.

8. Life Safety Code, Bulletin No. 101, National Fire Protection Association.

9. All Work Under Jurisdiction of Local Fire Marshal shall conform to requirements set forth by Fire Marshal's Office and National Fire Protection Association.

C. Nothing contained in the Plans and Specifications shall be construed to conflict with these laws, codes and ordinances and they are hereby made a part of these Specifications.

1.04 OHIO ENERGY CODE

A. The Mechanical System must comply with all requirements of the State of Ohio "Code for Energy Conservation". This includes, but is not limited to, efficiencies, power factors, insulation thickness, etc.

B. All motors 1 HP or more shall be “energy efficient” motors meeting all requirements of ASHRAE Standard 90.1 - 2010.

1.05 UTILITIES

A. The Contractor shall investigate and locate all utilities prior to construction.

B. Each Contractor is responsible for rerouting or replacing existing utilities where necessary to permit installation of his work.

C. Support, protection and restoration of all existing utilities and appurtenances shall be the responsibility of the Contractor. The cost of this work shall be included in the price bid for the various items.

D. The Contractor shall alert immediately the occupants of nearby premises as to any emergency that he may create or discover on or near such premises of the underground facility, any break or leak on its lines or any dent, gouge, groove or other damage.

E. Procedure for making connections to existing utilities shall be planned at least two weeks in advance of the work and the work shall be executed in a manner to provide reasonably continuous service throughout the construction period. **Connections shall be made only at times approved by the University.** For interruption of service in major utility systems, the Contractor must submit to the A/E a step-by-step sequence of operations planned to accomplish the work. Outline must show tentative dates and times of day for shut-off and restoration of services. The A/E will review the information given with the University Architect, who, upon approval of the planned operations, will make arrangements with appropriate University personnel for interruption of services. If University assistance is anticipated for utility connections/disconnections consult with the Utilities Division Director, Department of Physical Facilities to obtain current construction outage charges. Charges for University assistance for building systems outages may be obtained by consulting with the Maintenance Division Director, Department of Physical Facilities. **Caution to Bidders: Bidders are cautioned that the University will probably schedule interruption of services at times other than the contractors' normal working hours and that only designated University personnel are authorized to interrupt services.** Frequently, outages are scheduled between quarters to reduce disruption of classes.

1.06 OPERATING AND MAINTENANCE INSTRUCTIONS

A. The contractor shall thoroughly instruct and supervise University's Maintenance Personnel in the proper operation and maintenance of the mechanical system equipment. The contractor shall be responsible for arranging for the instruction and supervision at a time convenient to University and notifying the A/E of the time at least 48 hours in advance.

B. Furnish one (1) copy of the printed Operating and Maintenance Instructions for the Mechanical Systems for review. Copy shall be neat, legible and bound in a hardback 3-ring notebook. After final approval, provide four (4) copies of Operation and Maintenance Instructions for submittal to Owner. Instructions shall consist of the following items:

1. Title Page: Title of Project, address, date of submittal, name and address of Contractor, name of A/E.

2. Second Page: Index of Manual Contents.

3. First Section: A copy of each approved shop drawing and submittal with an index at the beginning of the section.

4. Second Section: A list of all equipment used on the project, together with supplier's name and address.

5. Manufacturer's maintenance manuals for each item of equipment furnished under this contract. Manuals shall include such items as parts list, detailed lubrication instructions, procedures for performing normal maintenance functions, preliminary trouble shooting procedures and wiring diagrams.

6. Complete wiring diagrams for the mechanical systems as actually wired including control and interlock wiring.

7. Brief but complete instructions for start-up, shut- down and routine maintenance of each system.

8. Routine and 24-hour emergency information:

   a. Name, address and telephone number of servicing agency.

   b. Include names of personnel to be contacted for service arrangements.

C. Frame one (1) copy of brief start-up, shut-down and routine maintenance instructions and complete system wiring diagrams under glass and mount on the Equipment Room wall. Temperature Control schematics may be laminated with plastic at the Contractor's option.

1.07 RECORD DOCUMENTS

A. The Contractor shall keep an accurate record of all deviations from Contract Drawings and Specifications. He shall neatly and correctly enter in colored pencil any deviations on Drawings affected and shall keep the Drawings available for inspection. Extra sets of Drawings will be furnished for this purpose.

B. At the completion of project and before final approval, make any final corrections to Drawings and certify to the accuracy of each print by signature and deliver same to University.

1.08 SUPERVISION

A. The contractor shall have in charge of the work, on the job during construction, a competent superintendent experienced in the work installed under this Contract.

1.09 UNACCEPTABLE WORK AND OBSERVATION REPORTS

A. Work shall be unacceptable when found to be defective or contrary to the Plans, Specifications, Codes specified or accepted standards of good workmanship.

B. The Contractor shall promptly correct all work found unacceptable by the A/E or University whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such unacceptable work, including compensation for the A/E's or University's additional services made necessary thereby.

C. During the course of construction, the A/E will prepare "Observation Reports" with a list of items found to be in need of correction. All items listed shall be corrected by the Contractor. A space is provided on the form for the Contractor to note the completion of each item. All prior "Observation Report" items must be completed, the lists signed and returned to the A/E prior to making the final inspection. After the final list is issued, the same procedure will apply.

1.10 FINAL INSPECTION

A. When the Contractor determines all work is completed and working properly per the Contract Documents, he shall request a "final" inspection by the A/E in writing. If more than one re-inspection is required after this final inspection, the Contractor shall bear all additional costs including compensation for the A/E's additional services made necessary thereby. A final inspection will not be made until Operating and Maintenance Manuals and Air Balance Reports are submitted and approved and all prior "Observation Report" punch lists completed, signed and returned to the A/E.

B. As part of the final checkout of the project, the A/E will be checking out the operation of the various systems. The contractor shall provide such assistance as required (including manpower and tools) to start and stop the various systems, open and close valves etc. and simulate summer, winter and other temperature control sequences. The Contractor (not the A/E) is responsible to turn on the systems and demonstrate they are operating properly.

1.11 GUARANTEE

A. The contractor is responsible for all defects, repairs and replacements in materials and workmanship, for a period of one (1) year after final payment is approved by A/E.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 23 01 10

MANUFACTURER'S DRAWINGS

PART 1 GENERAL

1.01 SCOPE

A. The Contractor shall submit to the A/E for review, within one week after date of contract, ten (10) copies of manufacturer's drawings, wiring diagrams, fan curves or data. The Engineer will review Contractor's shop drawings and related submittals (as indicated below) with respect to the ability of the detailed work, when complete, to be a properly functioning integral element of the overall system designed by the Engineer. Before submitting a shop drawing or any related material to the Engineer, Contractor shall: review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of Contractor; approve each such submission before submitting it; and so stamp each such submission before submitting it. The Engineer shall assume that no shop drawing or related submittal comprises a variation unless Contractor advises Engineer otherwise via a written instrument which is acknowledged by Engineer in writing. The shop drawings and related material (if any) called for are indicated below:

Heating, Ventilating and Air Conditioning Contract

Registers, Grilles, Diffusers and Dampers
HVAC Insulation
VAV Boxes
Piping Specialties

Temperature Controls Contract

Temperature Control Products
Control Sequences
Wiring Diagrams
See Section 25 00 00 for other submittal requirements

B. The Engineer shall return shop drawings and related materials with comments provided that each submission has been called for and is stamped by Contractor as indicated above. The Engineer shall return without comment material not called for or which has not been approved by Contractor.

C. The contractor shall furnish equipment shop drawings which will indicate power hook up and control connections as required for mechanical equipment. "Stock" wiring diagrams are NOT ACCEPTABLE.

D. The manufacturer shall provide a statement on submittals that equipment furnished complies with the Ohio Energy Code. This previously relates to high efficiency motors, EER's, COP's, etc. If this is not done, submittals will be rejected.

E. A/E's review of manufacturer's drawings or schedules shall not relieve the Contractor from compliance with the requirements of the plans and specifications.

1.02 QUANTITIES

A. Items may be referred to in singular or plural on Plans and Specifications. Contractor is responsible for determining quantity of each item.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

Not Applicable

END OF SECTION

SECTION 23 05 13

ELECTRICAL WORK

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 01 05 - Paragraph 1.05 - OHIO ENERGY CODE
B. Section 25 00 00 - TEMPERATURE CONTROLS
C. Division 26 - ELECTRICAL

1.02 SCOPE

A. The contractor shall furnish all motors for his equipment. Motor starters, safety switches and wired junction boxes shall be furnished and installed by the Electrical Contractor except where specifically specified to be furnished with certain mechanical equipment.

1.03 WORK INCLUDED - Contractor:

A. Temperature Control wiring by Temperature Control Contractor except as noted below by Electrical Contractor.

B. 120 volt wiring required for mechanical equipment when not shown or specified elsewhere.

1.04 WORK INCLUDED - Contractor.

A. All power wiring.

B. All conduit and wiring incidental to Temperature Controls, including switches, controls, transformers and relays shall be by the Temperature Control Contractor, except wiring as indicated on the Electrical Drawings will be by the Electrical Contractor.

C. Motor starters, contactors, and disconnects where noted under "PRODUCTS" below.

D. Electrical Contractor shall provide 120 volt control power to a wired junction box near the Temperature Control Cabinets. Final connections to be made by the Temperature Control Contractor.

1.05 SHOP DRAWINGS:

A. The Contractor shall furnish to the Electrical Contractor, equipment shop drawings which will indicate power hook-up and control connections as required for mechanical equipment. "Stock" Wiring Diagrams are Not Acceptable.

B. Prepare, as a part of Temperature Control shop drawings, complete terminal-to-terminal wiring diagrams. These will show terminal designations on control items and equipment. Wiring diagrams to be compatible with Electrical Drawings.

PART 2 PRODUCTS

2.01 Refer to Section 23 01 05 - Paragraph 1.05 for "Energy Code" requirements (Particularly power factor correction)

2.02 Refer to Division 16 - ELECTRICAL.

2.03 All motors 1/2 HP and larger shall be three phase; all motors, 1/3 HP and smaller shall be single phase unless specified otherwise.

2.04 All single-phase motors provided by the contractor to have built-in thermal overload protection.

2.05 All motors furnished shall have copper windings and all motors five (5) horsepower and greater shall have factory installed lifting eyebolts. All motors shall conform to ANSI and NEMA standards.

2.06 Motor starters, contactors, and disconnects are provided and installed by the Electrical Contractor, unless part of packaged equipment furnished by the contractor, or otherwise specified.

2.07 All motors used in variable speed applications shall be high efficiency type and shall be rated for use with variable frequency drives.

PART 3 EXECUTION

3.01 All wiring, conduits, etc., shall be in strict accordance with the requirements of the latest edition of the National Electrical Code and Division 26, Electrical specification.

3.02 All wiring, including low voltage wiring, shall be run in conduit.

3.03 Low voltage wiring may be size and type recommended by the Manufacturer and/or Temperature Control Contractor.

END OF SECTION

SECTION 23 05 16

SLEEVES AND COLLARS

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 05 21 - CUTTING AND PATCHING

1.02 SCOPE

A. The contractor shall furnish and install all sleeves for his work. Coordinate carefully with the General Contractor.

B. Sleeves are not required if holes are core drilled through existing walls and floors.

PART 2 PRODUCTS

2.01 Sleeve material: black steel pipe, machine cut, large enough to allow l/4" clearance all around pipe (around pipe covering on heating water and cold water).

PART 3 EXECUTION

3.01 Sleeves in partitions to have length equal to the thickness of finished partitions. Sleeves in floors of finished areas to project l/8" above finished floor. Sleeves in floors of non-finished areas to project 3" above finished floor. Fill space between pipe and sleeves into exposed areas with sealing compound. Ream all sleeves before installing. Sleeves in floors of all Mechanical Rooms shall project 6" above floor and sealed to create a curb.

3.02 Where pipes pass through fire rated walls or floors, the space between the pipe and sleeve shall be filled with packing to maintain fire integrity.

3.03 In exposed location, other than in Mechanical Equipment Rooms, bare pipe or insulated pipe shall be provided with chromium plated collars at floor, ceiling, and at partitions.

3.04 Cutting required of any existing masonry wall or floor shall be done by core drilling.

3.05 Piping not allowed to bear on sleeves.

3.06 Sleeves shall be installed plumb and true to line, grade, and position.

3.07 Unused sleeves shall be plugged and finished to match adjacent surface.

END OF SECTION

SECTION 23 05 17

FIRESTOPPING

PART 1 – GENERAL

1.01 REFERENCE

A. Drawings and general provisions of the Contract, including General and Supplementary conditions and Divisions 01 Specifications Sections, apply to this Section.

1.02 SCOPE

A. The CM shall be responsible for firestopping around all openings for pipes, ducts, conduits, etc., installed by him at all fire walls and smoke walls. Firestopping shall be performed by an installer who has been trained by manufacturer, or manufacturer's representative, in the installation procedures based on published UL tested fire stop systems.

1.03 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.04 GENERAL REQUIRMENTS

A. Test Requirements: ASTM E-814, "Standard Method of Fire Tests of Through Penetration Fire Stops" (July 1997).

B. Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

1. UL Fire Resistance Directory:

a. Through-Penetration Firestop Devices (XHCR)
b. Fire Resistance Ratings (BXUV)
c. Through-Penetration Firestop Systems (XHEZ)
d. Fill, Voids, or Cavity Material (XHHW)
e. Forming Materials (XHKU)

C. International Firestop Council Guidelines for Evaluating Firestop Systems Construction Managering Judgments

D. ASTM E-84, Standard Test Method for Surface Burning Characteristics of Building Materials.

E. The Ohio Building Code (OBC)

G. NFPA 101 - Life Safety Code

1.05 QUALITY ASSURANCE

A. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate CM personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

B. Firestop System installation must meet requirements of ASTM E-814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural Construction Manager prior to penetrating any load bearing assembly.

E. For those firestop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's Construction Manager judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Construction Manager judgment drawings must follow requirements set forth by the International Firestop Council (September 7, 1994).

1.06 SUBMITTALS

A. Submit Product Data: Manufacturer’s specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions.

B. Manufacturer's Construction Manager judgment identification number and drawing details when no UL system is available for an application. Construction Manager judgment must include both project name and CM’s name who will install firestop system as described in drawing.

C. Submit material safety data sheets provided with product delivered to job-site.

1.07 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training

to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the CM or to an Installer engaged by the CM does not in itself confer qualification on the buyer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.09 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Scheduling

1. Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

2. Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 – PRODUCTS

2.01 FIRESTOPPING, GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the

firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that is needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Hilti, Inc., Tulsa, Oklahoma, (800)879-8000
2. Tremco Sealants & Coatings, Beachwood, Ohio, (216) 292-5000
3. 3M Fire Protection Products, St. Paul, Minnesota, (612) 736-0203

2.03 MATERIALS

A. Use only firestop products that have been UL 1479, ASTM E-814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Cast-in place firestop devices are installed prior to concrete placement for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors, the following products are acceptable:

1. Hilti CP 680 Cast-In Place Firestop Device
2. Fox Coupling, Inc. "Cast-In-Place Firestop Coupling".
3. Proset Cast-In-Place Device

C. Sealant or caulking materials for use with non-combustible items including steel pipe & copper pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant
2. 3M Fire Barrier CP25 or Firestop Sealant 2000
3. Tremco Fyre Shield

D. Sealant or caulking materials for use with sheet metal ducts, the following products are acceptable:

1. Hilti CP 601S Elastomeric Firestop Sealant or CP 606 Flexible Firestop Sealant
2. Tremco Fyre-Shield High Performance Ceramic Firestop Sealant
3. 3M Fire Barrier CP25WB+ or 2000 Silicone Sealant

E. Intumescent sealant or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe and plastic pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant
2. 3M Fire Barrier CP25WB+
3. Tremco Intumescent Acrylic or TremStop WBM

F. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti CP 642 and CP643 Firestop Collar, CP645 Wrap Strip
2. Tremco TREMstop D Combustible Pipe Intumescent Device System and TremStop WS Wrap Strip
3. 3M Ultra Plastic Pipe Device and Fire Barrier FS-195+ Wrap Strip

G. Materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 635 Trowelable Firestop Compound and FS 657 FIRE BLOCK
2. Tremco TremStop M Fire Rated Mortar and PS Pillows
3. 3M Fire Barrier CS-195+ Composite Sheet

H. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 657 FIRE BLOCK
2. Tremco PS Firestop Pillows
3. 3M CS Intumescent Sheet

I. Provide a firestop system with an "F" Rating as determined by UL 1479 or ASTM E814. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated.

PART 3 – EXECUTION

3.01 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.

2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.03 INSTALLATION

A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.

1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

2. Consult with mechanical Construction Manager and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

3. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas. All penetrations are to be labeled in accordance with the Construction Manager’s standard labeling system. The CM shall coordinate all fire stopping requirements with the Construction Manager prior to start of work.

B. Keep areas of work accessible until inspection and approval have been completed.

C. All fire stopping shall be inspected and approved by a licensed independent Consultant. All unapproved fire stopping products installed by the CM will be removed and replaced at his expense.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

3.05 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

END OF SECTION

SECTION 23 05 19

PIPING SPECIALTIES

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all necessary piping specialties to include air vents, Pete's Plugs, pipe strainers, etc., for piping systems included under this Contract.

PART 2 PRODUCTS

2.01 Air Vents

A. Air vents shall be as manufactured by Bell and Gossett, Taco, Trane, Thrush, Dunham Bush or Hoffman. Install at high points of system on each heating and cooling coil and at other locations subject to air binding.

1. Manual air vents shall be ball valves piped as detailed on the drawings. For use on individual heating elements.

2.02 Strainers

A. All water lines – Splirax/Sarco style IF-125 (flanged) or IT (threaded) 125 psig, Y-pattern, cast iron body with stainless steel screen for water. Threaded for 2-1/2" and smaller, flanged for 3" and larger.

B. Dunham-Bush, Spirax/Sarco, Armstrong, Trane, McAlear, Mueller, Metraflex, Wheatley or V. D. Anderson strainers may be furnished at the CM's option.

2.03 Pete's Plug -

A. 1/4" MPT fitting to receive either a temperature or pressure probe, 1/8" O.D. fitting and caps shall be brass with valve core of Nordel, rated at 1000 psig.

B. Provide XL (extra long) type Pete's plug in insulated lines.

C. Sisco plugs may be furnished at the Contractor's option.

PART 3 EXECUTION

3.01 All specialties to be installed in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 23 05 20

PAINTING

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 05 53 - TAGGING AND CODING

1.02 SCOPE

A. All steel supports shall have minimum one (1) coat of metal primer after fabrication.

B. Factory finished equipment which has rusted or been damaged shall be cleaned at the completion of the project and rust spots and marred areas shall be refinished and restored to the original factory finish.

PART 2 PRODUCTS

2.01 Paint shall be as manufactured by ICI/Devoe.

PART 3 EXECUTION

Not Applicable

END OF SECTION

SECTION 23 05 21 - CUTTING AND PATCHING

PART 1 GENERAL

Not Applicable

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 Cutting for openings, when necessary, shall be done by the contractor with such tools and methods as to prevent unnecessary damage to surrounding areas or equipment.

3.02 The corners of all openings in poured concrete shall be core drilled to minimize overcutting.

3.03 Fill space in all areas where core drilled with packing where required to maintain fire rating. Openings shall be temporarily fire-stopped until permanent fire stopping is done. This includes holes left due to removal of piping or ductwork.

3.04 All holes cut for the installation of piping, ductwork and equipment shall be neatly patched and refinished with the same materials as, and to match, adjacent surfaces, and damages thereto shall be repaired in kind and to match existing conditions by the contractor. This includes patching existing ceilings and floors where required and patching holes left by removal of existing piping, ductwork, equipment, etc.

3.05 Patching shall match existing surfaces in kind and finish.

3.06 No structural member will be cut into without the expressed permission of A/E.

END OF SECTION 23 05 21

SECTION 23 05 22

FOUNDATIONS AND SUPPORTS

PART 1 GENERAL

1.01 SCOPE

A. The Contractor shall furnish welded steel frames and supports for all equipment requiring same. Furnish auxiliary steel as required for supporting pipes.

PART 2 PRODUCTS

2.01 All steel for frames and supports shall be standard weight black steel pipe or standard structural steel shapes.

2.02 All exterior frames and supports shall be galvanized.

PART 3 EXECUTION

3.01 Grind all sharp corners and projections on supporting steel after fabrication. All steel shall have one (1) coat of metal primer after fabrication. All steel supports exposed to the weather shall be finished with a heavy coat of bitumastic.

END OF SECTION

SECTION 23 05 23

VALVES

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all necessary valves for piping systems and equipment in the building required to provide proper shut off and balancing of systems included under this Contract.

PART 2 PRODUCTS

2.01 Check valves shall be Crane, Milwaukee, or Watts and shall all be by the same manufacturer.

2.02 Ball valves shall be as manufactured by Grinnell, Apollo, Watts, or any of the manufacturer's listed herein for gate, globe and check valves. All ball valves to be by the same manufacturer.

2.03 Ball Valves

A. 3" size and smaller may be two-piece bronze body ball valve, screwed piping connections, union connection body, teflon seats, full port, blowout proof stem, adjustable packing gland, stainless steel ball, and lever handle labeled for service controlled. Rated for 150 S.W.P. and 400 WOG. Equal to Apollo 70-300 Series.

B. All ball valves shall be full port type.

2.04 Drain valves shall be ball valves as specified above with hose nipple and cap.

2.05 Check Valves

A. 3" and larger - iron body, bronze mounted, horizontal swing check with bronze disc, flanged, 125 lb. S.W.P.

B. 2-1/2" and smaller - all bronze, horizontal swing check with bronze or TFE disc, screwed, 125 lb. S.W.P.

C. Clow, McAlear, Mueller or Metraflex non-slam check valves are acceptable manufacturers as well as previously listed manufacturers.

2.06 Combination Balance and Stop Valve - Bell and Gossett "Circuit Setter Plus", bronze body, screwed combination balance and stop ball valve. 2½" and smaller screwed. 3" and larger flanged. Valves to have readout ports, 1/4" drain port, memory stop indicator,

calibrated nameplate, 300 lb. W.O.G. Valves shall be designed for a pressure drop of 2 to 5 feet heat. Same type Illinois, Spirax Sarco, Flow Design, Taco or Tour & Anderson stop and balance valves may be furnished at the CM's option.

PART 3 EXECUTION

3.01 The contractor shall install all valves in strict accordance to the manufacturer's recommendations.

3.02 Where the Drawings call for both a shut-off valve and a balance valve or fitting, the Contractor may, at his option, furnish a combination balance and stop valve.

3.03 Where drain lines are not piped to floor drains, furnish hose end adapters. Provide caps for all hose end adapters.

3.04 Ball valves designated with an “M” shall be furnished with memory stops.

END OF SECTION

SECTION 23 05 29

INSERTS, PIPE HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all necessary inserts, beam clamps and auxiliary steel for pipe hangers in the building.

B. Furnish and install necessary pipe hangers and supports to properly support all piping and to maintain uniform elevation.

PART 2 PRODUCTS

2.01 HANGERS

A. Hangers for copper lines, 2" and smaller, shall be similar to Grinnell Fig. CT-99, adjustable carbon steel pipe ring, with 3/8" hanger rods. All copper plated.

B. Hangers for copper lines 2-1/2" to 4" shall be similar to Grinnell Fig. CT-65, adjustable carbon steel clevis, with proper size rods, all copper plated. Unplated clevis may be used if full round lead sleeves 2" wider than the clevis are secured to the pipe at each hanger.

C. When copper lines are insulated and hangers are sized for outside of insulation, provide steel hangers as described below.

D. Hangers for steel lines 2" and smaller shall be similar to Grinnell Fig. 97, adjustable pipe ring, galvanized steel band with 3/8" hanger rods.

E. Hangers for steel lines 2-1/2" and larger shall be similar to Grinnell Fig. 260, adjustable carbon steel clevis, heavy duty, with proper size rods.

F. Hangers for chilled water lines 1-1/4" and larger shall be sized for outer diameter of insulation. Furnish 1/2 round galvanized sheet metal insulation protectors minimum 12" long similar to Grinnell Fig. 167 on bottom half of insulation for heating and chilled water lines 1-1/4" and larger at each pipe hanger.

2.02 B-Line, F & S, Elcen, Penn, Fee-Mason, PHD Manufacturing or Modern Pipe Hangers of the same type may be furnished at the Contractor's option.

PART 3 EXECUTION

3.01 Riser clamps shall be used at each floor where required.

3.02 Wall bracket pipe supports shall be installed where required.

3.03 All copper piping is to be shielded from steel pipes or electrical conduit with sheet lead or electrical tape wherever pipes would touch each other.

3.04 Galvanized hangers and strap hangers will not be permitted for supporting copper lines except for hangers sized for outside of insulation.

3.05 Provide pipe anchors and guides where required to properly control pipe. Method to suit job conditions.

3.06 Support piping at equipment from floor, ceiling, or walls, so that piping weight is not supported directly from pumps or equipment.

3.07 All beam clamps and supports for piping and ductwork shall be in place prior to the fireproofing of the structural steel.

3.08 Piping to be supported according to the following schedule. Support at intervals not to exceed spacing listed or elsewhere as required in accordance with good workmanship. No pipe shall be supported from another pipe. All hangers shall be plumbed before insulation is applied and all hangers shall be double nutted.

SPACING

(1) Steel Pipe			(2) Copper Pipe	
Pipe Size	Rod	Spacing	Pipe Size	Spacing
Thru 1"	3/8"	7'0"	Thru 3/4"	6'0"
1-1/4"	3/8"	9'0"	1"	7'0"
1-1/2"	3/8"	9'0"	1-1/4"	9'0"
2"	3/8"	10'0"	2"	9'0"
2-1/2"	1/2"	11'0"	2-1/2"	11'0"
3"	1/2"	12'0"	3"	11'0"
4"	5/8"	14'0"	4"	11'0"
6"	3/4"	17'0"	6"	14'0"

END OF SECTION

SECTION 23 05 30

INSTALLATION OF PIPING

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 05 19 - PIPING SPECIALTIES
B. Section 23 05 23 - VALVES
C. Section 23 05 29 - INSERTS, PIPE HANGERS AND SUPPORTS
D. Section 23 05 93 - TESTS AND ADJUSTMENTS

1.02 SCOPE

A. The requirements of this Section shall apply to all interior piping systems installed under this Contract, except where otherwise noted on the Drawings or elsewhere in the Specifications.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 All piping systems shall be installed with adequate provisions made for expansion and contraction to prevent stresses on piping, valves and equipment. Anchor and guide piping at all points indicated and/or as required. Type and method of anchoring, guiding and attachments to sustaining members to suit job requirements and conditions and shall be approved by University.

3.02 Provide unions at each screwed valve, final connection, and at each piece of equipment. Branches from mains to equipment stubs, risers, etc., to have swing joints with at least one change of direction in the horizontal plane, and one change of direction in the vertical plane, before connecting to equipment or fixtures. Piping shall be arranged and unions and flanges located to permit easy removal of valves, parts, and equipment for inspection and cleaning without disconnecting any part except unions or flanges. No welded connections shall be made to valves or equipment. Use bronze unions in copper lines. Unions to be downstream of valves.

3.03 Flange bolts shall be cut to proper length so that one thread projects beyond the nut when nut and bolt are tightened.

3.04 Make proper connections to all items of equipment in the Contract as recommended by the Manufacturer or as detailed on the Drawings.

3.05 All piping shall be arranged in accordance with the best standards of the trade with vertical pipes plumb and horizontal runs parallel or perpendicular to the building wall.

3.06 Provide valves and specialties where indicated on the Drawings.

3.07 Provide 3/4" drain valves in piping at low points to provide complete drainage of all systems and as shown on the Drawings.

3.08 Ream ends of pipe and clean before installing.

3.09 All joints in copper piping shall be made with 95-5 solder. Solders and fluxes containing lead are prohibited.

3.10 Use pipe dope on male threads of screwed pipe only. Teflon pipe joint tape may be used, at the Contractor's option.

3.11 Valves to be installed with handwheel at or above center of pipe. Valves outdoors exposed to weather shall be installed with handwheel in the horizontal.

3.12 Make all changes of direction with fittings, rather than bending.

3.13 All valves and unions to be installed so as to be accessible through ceiling, access panels, etc.

3.14 Provide dielectric unions or insulating flanges between dissimilar metals, i.e., copper to steel.

3.15 Bull head connections in any piping service are expressly prohibited.

3.16 At the end of each day's work and otherwise as required or directed, provide caps and/or plugs at all openings in piping for protection. Particular attention must be given to avoid the possibility of any foreign materials entering the pipes, whether it be inadvertent or with malicious intent.

3.17 Install thermometers and gauges so they may be read from floor level.

3.18 Install Pete's Plugs as close as possible to control valves, coils, etc., as shown on the Drawings, and arranged so that a probe may be inserted into the plug.

3.19 Where piping is installed in accessible chases, keep all piping to sides of chase, except portions which must necessarily be in center of chase. Offset vents to side immediately above connection to waste line. All lateral runs are to be located at the floor or minimum 6'-0" above floor, and all vertical piping held close to the wall through that height leaving maximum service space.

3.20 Where pipe drops occur in block walls, pipes to enter and leave walls at block joints. Coordinate with General Contractor.

3.21 Install galvanized sheet metal troughs with drains under pipes crossing electrical equipment. Seal to make water tight.

3.22 Do not run water or steam piping through electrical rooms.

3.23 Properly support all relief valve discharge piping and provide no more than one 90° ell.

END OF SECTION

SECTION 23 05 53

TAGGING AND CODING

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install pipe markings, equipment labels and valve tags as described below.

PART 2 PRODUCTS

2.01 MATERIALS

A. Snap around pipe markers.

B. Tags shall be non-ferrous metal with number and service abbreviation engraved in the tag.

PART 3 EXECUTION

3.01 EQUIPMENT

A. Each piece of equipment shall be labeled by means of 2" high stenciled, painted lettering, and by a permanent metal tag fastened to the unit. The stamped marking shall be permanent on the metal tag.

B. Labeling shall consist of the unit designation as shown on the drawings and in addition, labeling of exhaust fans shall indicate the rooms or areas being served. Room numbers shall be from the Miami University numbering system, not those indicated on the drawings.

C. Insure that nameplates are provided in readable locations. If they are not, they shall be removed and replaced in a visible location.

3.02 PIPE MARKINGS

A. Markings shall be applied to all new piping after installation, insulation and final painting. Markings shall consist of 1" high black letters, a color coded band and a direction arrow. Markers shall be placed at 25 foot centers on both exposed and concealed piping. Painting letters by use of stencils is acceptable. Color code as follows:

Item	Color Bands	Abbr.
Heating Water Supply	Yellow-Red	HHWS
Heating Water Return	Yellow-Orange	HHWR

3.03 VALVE TAGS

A. Each valve, including those installed adjacent to equipment for isolation of that item, shall be identified with a stamped aluminum or brass tag attached with a brass “S” hook or flexible metal wire. A printed schedule shall be prepared and framed under clear plastic or glass describing each valve by consecutive number, location and service for which used. On renovation work, begin new numbering with the last number used in the existing sequence. Two additional unframed copies shall be furnished, all being turned over to the A/E with a letter of transmittal. Copies shall also be included in the Owner’s Maintenance manual.

END OF SECTION

SECTION 23 05 54 - EQUIPMENT IDENTIFICATION

PART 1 GENERAL

1.01 SCOPE

A. The contractor shall label all disconnects, motor starters, switches and equipment furnished under this Contract.

PART 2 PRODUCTS

2.01 Labels shall be 1/16" thick laminated plastic nameplates or 0.020" thick aluminum nameplates. Background shall be black with 3/16" letters engraved on the face. Letters shall be white or natural aluminum.

PART 3 EXECUTION

3.01 Secure plates with screws. Do not attach to covers where covers can be easily mixed up. Coordinate with the Contractor so that all nameplates are the same type and design.

END OF SECTION 23 05 54

SECTION 23 05 93

TESTS AND ADJUSTMENTS

PART 1 GENERAL

1.01 SCOPE

A. After work has been completed but before pipe covering has been applied, the Contractor shall test and adjust the systems he has installed.

B. University and the A/E shall be notified of all scheduled tests and adjustments at least 48 hours before they are scheduled so that he may witness same. If the Contractor performs any test or adjustment without the A/E present or without properly notifying the A/E, the Contractor will be required to perform the test or adjustment a second time in the presence of the A/E.

C. If University or the A/E determines that any work requires special inspection, testing, or approval, they will, upon written authorization, instruct the Contractor to order such special inspection, testing or approval. The Contractor shall give timely notice so the A/E may observe the inspections, tests or approvals. If such special inspection or testing reveals a failure of the work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the A/E's additional services made necessary by such failure; otherwise University shall bear such costs, and an appropriate Change Order shall be issued.

D. Concealed lines shall be tested before being concealed. If this is not done and a leak appears during the final test, the contractor shall repair leak and all damage resulting therefrom.

E. The contractor shall adjust all his equipment in the mechanical system to obtain proper operation and shall demonstrate to University and the A/E that the entire system will function properly.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 After work has been completed but before pipe covering has been applied, the Contractor shall test the systems as follows. At these pressures, the circulation shall be free and the piping free of leaks.

System	Test Medium	Pressure Not Less Than	Time Not LessThan	Notes
Heating water	Water	125 lbs	24 hrs	no drop

3.02 Balancing Air and Water Systems:

A. The contractor shall procure the services of an independent company which specializes in the testing and balancing of air and water systems. All balancing work shall be done under the direct supervision of a qualified Heating and Ventilating Engineer. It shall be the responsibility of the contractor to make all necessary arrangements with the Balancing Company for balancing the air and water systems after all equipment, ductwork, outlets, piping and accessories have been installed. A detailed report on all balancing work shall be prepared and submitted, in triplicate, to the A/E for review. Each copy of the report shall be dated, signed by the supervising Engineer of the Balancing Company and bound in a suitable cover. The Balancing Company shall be selected by the Contractor from the following qualified firms:

1. Kahoe Air Balance Company
2. Any member of the Associated Air Balance Council

B. Balancing procedures and report to be in accordance with procedures set forth by the Associated Air Balance Council. **Report shall also include fan curves for all equipment and written procedures for balancing each piece of equipment.**

C. Where Pete's Plugs are installed, report shall include pressure drop readings across coils, control valves (Cv), etc., to confirm flow rates.

D. Balance reports shall include starter element sizes, and amperage ratings for each motor. If starter elements amperage rating is more than 10 percent greater or less than motor nameplate amperage, the contractor shall inform the Electrical Contractor to furnish and install proper size elements. Balance report shall include the corrected proper size starter element sizes and amperage ratings.

E. Balance Subcontractor shall report by letter to the A/E on preliminary results of balancing before the final balance report is prepared. This report shall include any problems encountered during balancing or major deviations from specified conditions.

F. If required, a meeting shall be arranged between the contractor, the Balance Subcontractor and the A/E to resolve any problems or deviations from the Contract Drawings and Specifications before the final balance work is completed and final report is submitted for review by the A/E.

3.04 All dampers, damper operators and motor operated valves shall be checked and adjusted for proper operation and travel.

3.05 Before turning job over to University, inspect all valves and repack valves as necessary.

3.06 The contractor shall adjust all equipment in the mechanical system to obtain proper operation and shall demonstrate to University and the A/E that the entire system will function properly.

END OF SECTION

SECTION 23 05 94

PROTECTION AND CLEANING

PART 1 GENERAL

Not Applicable

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 Protect all mechanical equipment against damage from any cause whatsoever and pay the cost of replacing and repairing equipment made necessary by failure to provide suitable protection.

3.02 After all piping, equipment and ductwork has been approved and after all plastering has been completed, bare piping and insulation provided under this Contract shall be thoroughly cleaned of dirt, grease, rust and oil.

3.03 Repair all dents and scratches in factory prime or finish coats on all mechanical equipment to the satisfaction of A/E. If damage is excessive, replacement may be required.

3.04 Flush out all piping systems to remove all dirt and grease from pipes and equipment before systems are placed in operation. Clean strainers after each flushing until the strainer remains clean.

3.05 The HVAC Contractor shall clean all water piping systems under this Contract. After systems have been flushed thoroughly and drained, clean as follows:

A. Completely fill, air vent, and circulate systems for four (4) hours at design temperatures with the following solution:

One pound of trisodium phosphate for each 50 gallons of water or one pound of sodium carbonate for each 30 gallons of water.

B. Completely drain and refill with fresh clear water.

C. After venting and circulating, check pH.

D. If system pH is below 7, add small amounts of cleaner until pH is between 7 and 8.

3.06 Ductwork and air handling equipment is to be cleaned out and blown out.

3.07 Ducts serving renovated areas shall be capped during construction. Return air grilles in renovated rooms shall also be sealed closed to prevent duct from being drawn into the building air handling system. Temporary exhaust shall be provided to keep the renovated rooms negative with respect to adjacent areas during construction.

3.08 Cover all motors, fans, open pipes, etc., to keep out dirt, water and weather during construction.

3.09 The contractor shall clean up and remove all debris from the site and shall at all times keep the premises in a neat and orderly condition.

END OF SECTION

SECTION 23 05 96

SUBSTITUTIONS

PART 1 GENERAL

1.01 SCOPE

A. The Base Bid shall be based on equipment as specified. Where items are mentioned thusly, "may be furnished at the Contractor's option", the Contractor may use any one of the items named for his Base Bid. Proposals for substitutions are welcomed, but must be noted separately from the Base Bid and applied for in writing at Bid submittal.

B. Where the Contractor furnishes equipment or material specified as equal or which is accepted as a substitution, he is responsible for all modifications required for his work, and work of all other trades to install the equipment and insure performance as originally specified.

C. Equipment and materials furnished as equal must be equal in quality, design, features, performances, arrangement, and appearance to that specified as standard.

1.02 Read instruction to Bidders and General and Special Conditions for requirements for substitutions.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

Not Applicable

END OF SECTION

SECTION 23 05 97

REMODELING

PART 1 GENERAL

1.01 REFERENCE

A. Division 1 - GENERAL REQUIREMENTS
B. Section 23 05 98 - DEMOLITION

1.02 SCOPE

A. The contractor shall include the remodeling of and additions to all mechanical work in the areas indicated on the Architectural and HVAC Drawings and in all areas shown on the Drawings. All necessary or required remodeling or additions to the present mechanical work shall be included in this Contract, as indicated or required, to the end that the work will result in the finished remodeled spaces shown on the Architectural Drawings.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 In all of the remodeling work the mechanical work shall follow the intent of the HVAC Specification insofar as possible with regard to material and workmanship.

3.02 Where old walls and furrings are removed, exposed piping that will remain in use shall be offset to the nearest available new wall or concealed space and reconnected as necessary or required, using all new material. Note that this shall include piping of every description at both known and unknown locations.

3.03 All piping installed in the remodeling work shall be installed as concealed work. The contractor shall do all cutting required.

END OF SECTION

SECTION 23 05 98

DEMOLITION

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 05 97 - REMODELING

1.02 SCOPE

A. The Contractor shall be responsible for all HVAC demolition in all areas that will be renovated as part of this project. Refer to the demolition drawings and demolition notes. The contractor shall be responsible for equipment disconnects and coordination with the general contractor to identify the equipment, piping, etc that is to be removed.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 23 07 00

HVAC INSULATION

PART 1 GENERAL

1.01 SCOPE

A. Extent of Work - Insulate pipes and other surfaces as follows:

Hot Water Heating Piping
Supply Air Ducts
Hot Water Reheat Coils
Tops of Supply Air Diffusers

B. Repair all existing insulation damaged by work of this project in kind and to match existing covering.

PART 2 PRODUCTS

2.01 All insulating materials, including jackets, cements, adhesives, vapor barriers, etc., shall be U.L. listed with a flame spread rating not to exceed 25 and a smoke developed rating not to exceed 50.

2.02 Molded plastic fitting covers shall be U.L. approved with a flame spread rating not to exceed 25 and a smoke developed rating not to exceed 50.

2.03 Pipe insulation shall be Johns Manville "Micro-Lok" glass fiber insulation rated for 850°F. with factory applied AP-1 all purpose, self-sealing vapor barrier jacket. Butt strips shall be minimum 3" wide of same material as jacket.

2.04 Duct insulation shall be Johns Manville rigid type as noted with FSK glass fiber reinforced foil faced flame resistant kraft paper vapor barrier facing.

2.05 Insulation thicknesses are based on insulation having thermal resistance in the range of 4.0 Hr F ft.^{2}/BTU to 4.6 Hr F ft^2/BTU per inch of thickness on a flat surface at a mean temperature of 75°F. Minimum insulation thickness shall be increased for materials having R values less than 4.0 or may be reduced for materials having R values greater than 4.6 to give equivalent "R" values.

PART 3 EXECUTION

3.01 Insulation Thickness Table

A. In the absence of a specified insulation thickness, the following table shall apply:

MINIMUM PIPE INSULATION

Piping System Types	Fluid Temperature	Runouts up to 2"*	INSULATION THICKNESS IN INCHES FOR PIPE SIZES 1" and less	1-1/4 to 2"	2-1/2" to 4"	5" to 6"	8" and larger
HEATING SYSTEMS hot water							
Low Pressure/Temp	201-250	1	1	1-1/2	1-1/2	2	2
Low Temperature	120-200	1	1	1	1	1	1-1/2

*Runouts not exceeding 12 ft. in length to Individual Terminal Units.

3.02 Cover hot water heating piping as follows:

A. Cover all piping with glass fiber pipe insulation. Minimum insulation thickness to be as shown in the Table (3.01).

B. Fittings shall be wrapped with compressed fiberglass to same thickness and density as adjacent pipe insulation and covered with a molded plastic fitting.

C. All mechanical couplings shall be wrapped with compressed fiberglass to the same thickness as adjacent pipe insulation and covered with a molded plastic fitting.

D. No covering required on supply and return lines inside heating units cabinets.

E. Valves, flanges and unions shall not be covered. Insulation shall be stopped square with valves, etc., and ends sealed with Benjamin Foster "Tight Fit" coating.

3.03 Cover all supply air ducts as follows:

A. All supply air ducts shall be insulated with 1-1/2" thick, 1 lb. density blanket flexible duct insulation.

B. Adhere insulation to duct surface with Foster No. 85-20 adhesive applied in 6" wide strips on 12" centers. Butt all edges of insulation and seal all joints with a foil-skrim-kraft tape or flange adhered over the joint. Secure insulation with flare door staples until the adhesive sets.

C. Seal all breaks and joints in vapor barrier with 2-1/2" wide pressure sensitive tape to match vapor barrier facing. Adhere with Foster 85-20 adhesive where necessary.

D. Cover all round and rectangular high and low pressure ductwork (including that on the downstream side of the air terminal boxes).

3.04 Cover the top of all supply diffusers above ceilings when not in a return air plenum. Insulation to be 1-1/2" thick, 1 lb. density flexible blanket.

3.05 Wrap hot water reheat coils when installed in ductwork or connected to terminal boxes in air conditioning systems. Insulation shall be 1-1/2” thick, 1 lb. density blanket flexible duct insulation properly sealed with adjacent insulation or ductwork. Insulation not required on reheat coils when exposed in the space being served.

3.06 Application shall be made on clean, dry surfaces with all joints butted firmly together.

3.07 All supply air conditioning ducts and all high pressure steam and chilled water pipe insulation to be continuous through floors, walls, ceilings, roofs and pipe hangers.

3.08 Insulation shall not be applied until the general construction has progressed sufficiently to insure against physical or moisture damage to the insulation. All damaged insulation shall be replaced at the contractor's expense.

3.09 Install 20 gauge galvanized steel insulation protectors on all insulated exposed pipes passing through floor. Sleeves to be 12" above the floor.

3.10 Hanger rods must be perpendicular before insulation is installed.

3.11 Longitudinal lap joints and butt strips for glass fiber pipe insulation shall be secured with staples or three (3") inch centers and sealed with an approved vapor barrier adhesive where applicable. Staples are not required when insulation utilizes a "double" adhesive self sealing system.

END OF SECTION

SECTION 23 21 13.23

HOT WATER HEATING PIPING SYSTEM

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 05 30 - INSTALLATION OF PIPING
B. Section 23 07 00 - HVAC INSULATION

1.02 SCOPE

A. From existing mains to the heating water coils and elsewhere as indicated on the drawings.

PART 2 PRODUCTS

2.01 Pipe – Schedule 40, black steel pipe.

2.02 Fittings for piping 2-1/2" and smaller - 125 lb. black cast iron except the Contractor may, at his option, use weld joints in piping 1-1/2" and larger. Use standard weight welding fittings.

2.03 Fittings for piping 3" and larger - standard weight welding fittings.

2.04 At the Contractor's option, weldolets, butt or threaded type, may be used for branch connections that are less than 2/3 main size. Use welded or screwed fittings for branch connections 2/3 main size or larger. Shaped nipples are not acceptable.

2.05 The Contractor, at his option, may use copper pipe and fittings for all pipe less than 2". Pipe shall be Type L hard drawn copper tubing with wrought copper solder type fittings. All joints shall be made with 95/5 solder.

PART 3 EXECUTION

3.01 Install water mains without pitch. Use eccentric reducing couplings at changes in size, with top of pipes at same elevation. Use concentric reducers in vertical mains.

3.02 Branches to units below mains to be taken from bottom of mains at a 45 degree angle, pitch downward toward units. Branches to units above mains to be taken from top of mains at a 45 degree angle, pitched upward toward units. Pitch not less than 1" in 10'.

3.03 Install manual air vents at high points of the system, as shown on the Drawings and as required for proper air venting of system.

END OF SECTION

SECTION 23 31 13.13

LOW PRESSURE DUCTWORK

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 07 00 - HVAC INSULATION
B. Section 23 33 13 - DAMPERS
C. Section 23 37 00 - REGISTERS, GRILLES AND DIFFUSERS

1.02 SCOPE

A. Furnish, install and insulate low pressure sheet metal work and appurtenances with sizes as shown on Drawings.

B. All sheet metal work including ductwork, dampers, etc., shall be fabricated in accordance with the recommendations of the Sheet Metal and Air Conditioning CMs National Association, Inc., (SMACNA) latest edition of the FOLLOWING:

1. HVAC DUCT CONSTRUCTION STANDARDS, Metal and Flexible.

PART 2 PRODUCTS

2.01 Sheet Metal Ductwork:

A. Unless otherwise noted, all sheet metal ducts and plenums shall be fabricated of lock forming quality, hot-dipped galvanized steel sheets and shall comply with 2" w.g. pressure class construction. Metal gauges shall be in accordance with current SMACNA Standards.

B. Flexible duct shall comply with NFPA requirements, Pamphlet 90A, and shall be UL listed with flame spread rating of 25 or less and smoke developed rating of 50 or less. Duct shall be a factory fabricated assembly composed of: an inner duct of woven and coated fiber glass providing an air seal and bonded permanently to corrosion resistant coated steel wire helix and 1" thick fiber glass insulating blanket and low permeability outer vapor barrier of fiber glass reinforced metalized film laminate.

Flexible duct shall be terminal duct for air system and shall not exceed 5 feet in length. Do not make more than one (1) 90 degree bend with flexible duct. Bend radius shall be minimum of two (2) times duct diameter.

1. Flexible duct shall be Thermaflex MKC.

2. Duct shall be rated for minimum 10" W.G. internal working pressure, for all duct sizes.

3. Vinyl, clear plastic or mylar type liners are expressly prohibited.

4. Flexmaster Type 3M insulated or Wiremold WCK flexible duct meeting all specified requirements may be furnished at the CM's option.

C. All fan flexible connections shall be made with commercial grade neoprene coated glass fabric (heavy duty).

D. All duct sealing compounds and mastics shall meet NFPA 90A standards and shall be UL listed with ratings not to exceed 25 for flame spread and 50 for smoke development.

E. Access doors shall be insulated, airtight, "hinged" and gasketed style, with a minimum of two quick action latches. Door shall be mounted in a galvanized steel frame with an inside "fold-over" flange for duct attachment. Door height shall be 24"; width shall be equal to the duct width or 12", whichever is less, unless otherwise shown or noted on drawings.

F. Sealer for ducts shall be equal to 3M Model EC-800. (Water Based Low VOC).

G. All joints in new low pressure ducts shall be sealed with duct sealer.

PART 3 EXECUTION

3.01 SHEET METAL DUCTS

A. Except as noted or shown otherwise on the Drawings, all sheet metal work including ductwork, dampers, etc., shall be fabricated and supported in accordance with the recommendations of the SMACNA "HVAC Duct Construction Standards".

B. Cross break all flat surfaces or reinforce with a bead approximately 5/16" wide x 3/16" deep on 12" centers, to prevent vibration on all ducts 19" maximum dimension and larger.

C. Sheet metal plenums shall be single wall construction, reinforced with steel angles 2 ft. on center. Provide hinged access doors where shown on the Drawings. Provide close off sheet metal as required. Provide neoprene sponge gaskets between filter frames and housing for mixed air plenums. Gauges same as specified for ducts, unless otherwise noted. At the CM's option, sheet metal ducts and plenums may be put together using "K-Lock", "Ductmate" or "TDC Lockformer" couplings.

3.02 FLEXIBLE AND ROUND DUCT CONNECTIONS

A. Connection of flexible and round ducts to rectangular ducts to be made with spin-in type fittings complete with damper with locking operator.

3.03 FITTINGS AND ACCESSORIES

A. Install flexible connections in all duct connections to fans and air handling units, unless otherwise noted.

B. Install manual balancing dampers with locking quadrants where shown on the Drawings and as required for proper balancing of the systems. Locking quadrants shall be easily accessible. On insulated ducts, locking quadrants shall be installed on outside of insulation.

C. Install double turning vanes in all right angle elbows. Install 45° tap collar for branch ducts and register openings.

D. Provide access doors in ducts to all automatic dampers, fire dampers and elsewhere as shown on drawings unless otherwise noted. Doors shall be minimum 12" x 24", or duct width x 24", whichever is smaller, unless otherwise noted. Access doors at fire dampers shall be located so that fire dampers may be reopened from them in case of fusible link failure.

E. Provide minimum 12" x 12" access doors in each supply air duct where smoke detector element passes through duct.

F. All duct joints in supply and return duct systems shall be made sealed with duct sealer.

G. All "Auto-Control" dampers shall be furnished by the Temperature Control Contracto, but installed by the Contractor. All other dampers, including "motorized dampers", shall be provided by the Contractor.

H. All round ductwork and fittings shall be spiral lockseam construction equivalent to United Sheet Metal. the use of Snap-Lock ductwork is prohibited.

I. The use of multi-piece adjustable angles and elbows is prohibited.

3.04 Exposed duct sealer is not acceptable on exposed ductwork. Ductwork shall be sealed on the inside or gasket ductwork shall be used.

END OF SECTION

SECTION 23 31 13.16

HIGH PRESSURE DUCTWORK

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 05 93 - TESTS AND ADJUSTMENTS
B. Section 23 07 00 - HVAC INSULATION
C. Section 23 33 13 - DAMPERS
D. Section 23 37 00 - REGISTERS, GRILLES AND DIFFUSERS

1.02 SCOPE

A. Furnish and install high pressure, high velocity sheet metal work and appurtenances with sizes as shown on Drawings.

1. All supply air sheetmetal from the connection to the existing mains to the new vav box inlets shall be high pressure construction.

C. All sheet metal work including ductwork, dampers, etc., shall be fabricated in accordance with the recommendations of the Sheet Metal and Air conditioning Contractors National Association, Inc., (SMACNA) latest edition of the "HVAC Duct Construction Standards, Metal and Flexible".

PART 2 PRODUCTS

2.01 All high pressure ducts shall be galvanized steel (unless otherwise noted) and shall comply with 6" w.g. pressure class construction in accordance with current SMACNA Standards.

2.02 All round ducts 60" diameter and smaller shall be spiral lockseam construction of gauges as recommended by SMACNA.

2.03 All flat oval ducts shall be spiral lockseam construction of gauges as recommended by SMACNA.

2.04 All flat oval duct sections shall not be more than 12 foot long and reinforced with angle braces at each joint and as a minimum at the mid-point between joints of each section. Spacing between braces shall not exceed duct manufacturer’s recommendation. Provide SMACNA recommended internal bracing for all flat oval high pressure exhaust ductwork.

2.05 All fittings shall be manufactured from 20 gauge (thru 36" diameter), 18 gauge (37" thru 50" diameter) and 16 gauge (51" and over) zinc- coated steel with continuous corrosion resistant welds.

2.06 All 90 degree elbows in size 3" through 8" diameter shall be die- stamped for minimum air friction loss with continuous corrosion- resistant welds.

2.07 Elbows - 9" diameter and over - 5-piece fabrication.

2.08 Square elbows - Mitered 90 degrees with minimum 4 or 5 turning vanes.

2.09 Tees and laterals - low loss conical type fittings straight or reducing as required.

2.10 Couplings, end caps, slip joints, concentric reducer and transitions to be standard fittings.

2.11 All access doors shall be 20 gauge, (U. S. Standard) reinforced, insulated, gasketed doors with sufficient quick opening fasterners to insure a tight seal, and provided with chain retainer and cover handle. Doors to open inward to serve as vacuum release devices. Minimum size of access doors shall be as follows:

ROUND DUCT		FLAT OVAL DUCT	
Size	Duct Diameter	Major Axis When Mounted On Major Axis	Minor Axis When Mounted On Minor Axis
8" x 12"	8" to 12"	8" to 16"	8" to 11"
12" x 12"	13" to 18"	17" to 24"	12" to 13"
14" x 20"	19" & over	25" & over	14" & over

2.12 All round and flat oval high velocity ductwork and fittings shall be as manufactured by United Sheet Metal, Semco, Tangent Air or Eastern.

2.13 All duct sealing compounds and mastics shall meet NFPA 90A Standards and shall be UL listed with ratings not to exceed 25 for flame spread and 50 for smoke development.

PART 3 EXECUTION

3.01 The conduit shall have been tested for leakage rate, friction loss, bursting and collapsing strength by a reputable independent engineering laboratory. Certified copies of these tests shall be supplied upon request. Material not meeting accepted industry standards will be rejected.

3.02 All circumferential joints shall be slip joints properly sealed with sealing compound inside the joint and mechanically fastened with drive screws. Use minimum number of drive screws to allow sealing compound to set properly. Coat outside of joint with sealing compound.

3.03 Construct square rectangular ducts and transitions with duct sealer in seams. Use mastic or suitable soft gaskets in joints. Bolt flanges with 1/4" bolts maximum 6" on centers.

3.04 See "Tests and Adjustments" Section for testing of high pressure sheet metal work.

3.05 Provide access doors adjacent to all dampers, including fire dampers, and control devices. Access doors at fire dampers shall be located so that fire dampers may be reopened from them in case of fusible link failure. All access doors shall be installed with sufficient quick opening fasteners to insure a tight seal.

3.06 Install flexible connections in all duct connections to all fans. All flexible connections shall be made with commercial grade neoprene coated glass fabric (heavy duty).

END OF SECTION

SECTION 23 33 13

DAMPERS

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 31 13.13 - LOW PRESSURE DUCTWORK
B.

1.02 SCOPE

A. Furnish and install dampers and appurtenances with size and capacities as shown on Drawings.

PART 2 PRODUCTS

2.01 MANUAL BALANCING DAMPERS

A. Based on Ruskin Type MD-35/0B opposed blade with molded synthetic bearings, 6" wide 16 gauge galvanized steel blades, extended shaft and linkage.

1. Balance dampers for round ducts shall be Ruskin MDRS- 25 single blade, 20 gauge galvanized steel.

2. All dampers shall be equipped with locking quadrants.

B. At the Contractor's option, manual balancing dampers shall be manufactured by the Contractor per SMACNA Standards. Dampers shall have locking quadrants on both sides of the duct.

2.02 AUTOMATIC CONTROL DAMPERS

A. Based on Ruskin Type CD-50, opposed blade with self- lubricating molded synthetic bearings, 5" X 1" X .125-6063 T5 extruded aluminum hat channel with hat mounting flanges on both sides of frame. 6" wide 6063 T5 heavy gauge extruded aluminum airfoil shape blades. Anti-leakage jamb seals, vinyl gasket blade seals, extended shaft and linkage. Maximum allowable leakage through dampers, 6 CFM per sq. ft. at 4" of static pressure behind louver.

B. Dampers shall be furnished with a low voltage electric operator by the Temperature Control Contractor. The Temperature Control Contractor shll field installed the actuators. Refer to Section 25 00 00 - TEMPERATURE CONTROLS.

2.03 FIRE DAMPERS

A. Fire dampers in low velocity ductwork shall be Ruskin model DIBD2 Dynamic Type "B" with interlocking hinged blades out of the airstream unless otherwise noted. All dampers shall be UL approved and labeled and shall meet all requirements of NFPA No. 90A. Furnish with UL labeled fusible links with temperature ranges to conform to NFPA recommendations. All fire dampers shall be dynamic type.

1. Furnish and install, at locations shown on the plans, dynamic fire dampers tested, constructed and labeled in accordance with the latest edition of UL Standard 555. Dampers shall have a fire rating of 11/2 hours and shall meet the requirements of the latest edition of NFPA90A.

2. Each damper shall include a 165°F fusible link and shall be labeled for use in dynamic systems. Dampers labeled for use in static systems only are not permitted. The damper shall be rated for dynamic closure at 2000 fpm and 4 inches w.g. static pressure and shall be rated to close with airflow in either direction.

3. Each dynamic fire damper shall include a steel sleeve and mounting angles furnished by the damper manufacturer to ensure appropriate installation. Submittal information shall include the fire protection rating, maximum velocity/pressure ratings and the manufacturer's UL installation instructions. The dampers shall be installed in accordance with the manufacturer’s UL installation instructions.

B. Fire dampers in high velocity ductwork shall be Ruskin multiple blade type FD60. All dampers shall be UL approved and labeled and shall meet all requirements of NFPA No. 90A. Furnish with UL labeled fusible links with temperature ranges to conform to NFPA recommendations. All dampers shall be dynamic type.

1. Furnish and install at locations shown on plans or as described in schedules multiple blade fire dampers constructed and tested in accordance with UL Safety Standard 555 that meet or exceed the following specifications. Damper frame (when size permits) shall be constructed using the UniFrame Design Concept (UDC) and shall be a minimum of 16 gage galvanized (1.52) steel formed into a structural hat shaped steel channel structurally superior to 13 gage (2.3) channel frame. The blades shall be single piece, airfoil shaped with 14 gage (1.90) equivalent thickness. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame.

2. Each fire damper shall have a 11/2 hour fire protection rating, 165°F fusible link, and shall have been tested to close under dynamic airflow conditions in a multiple section size with pressures up to 8" and velocities up to 4000 fpm. In addition, the dampers shall be AMCA licensed for air performance and shall bear the AMCA Certified Ratings Seal.

3. Fire dampers shall be approved for vertical or horizontal installation as required by the location shown and shall be installed using steel sleeves, angles, and other materials and practices required to provide an installation in accordance with the damper manufacturer's UL approved instructions.

2.04 Dampers by Ruskin, Air Balance, Arrow, American Warming and Ventilating, or Vent Products of the same type and meeting specified requirements, may be furnished at the Contractor's option.

PART 3 EXECUTION

3.01 Install dampers as recommended by manufacturer.

3.02 Inspect areas to receive dampers. Notify the A/E of conditions that would adversely affect the installation or subsequent utilization of the dampers. Do not proceed with installation until unsatisfactory conditions are corrected.

3.03 Install dampers at locations indicated on the drawings and in accordance with manufacturer's UL approved installation instructions.

3.04 Install dampers square and free from racking with blades running horizontally.

3.05 Do not compress or stretch damper frame into duct or opening.

3.06 Handle damper using sleeve or frame. Do not lift damper using blades, actuator, or jackshaft.

3.07 Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.

3.08 All dampers and damper operators shall be checked and adjusted for proper operation and travel.

3.09 All dampers shall be labeled per Ohio Building Code requirements.

3.10 Install dampers as recommended by manufacturer.

3.11 Provide access doors in the ductwork at all automatic control and fire dampers.

END OF SECTION

SECTION 23 36 16

MEDIUM VELOCITY VAV BOXES

PART 1 GENERAL

1.01 REFERENCE

A. Drawings and general provisions of the Contract, including General and Supplementary conditions and Divisions 01 Specifications Sections, apply to this Section.
B. Section 23 01 05, Paragraph 1.05 - OHIO ENERGY CODE.
C. Section 23 31 13.13 - LOW PRESSURE DUCTWORK.
D. Section 23 31 13.16 - HIGH PRESSURE DUCTWORK.
E. Section 25 00 00 - TEMPERATURE CONTROLS

1.02 SCOPE

A. Furnish and install a DDC variable volume, "pressure independent" medium velocity air terminal units with electronic operators for air volume control, access door, attenuator section and inlet valves. Size, capacity and noise level as shown on the drawings.

B. Boxes shall have a direct digital controller and electronic actuator furnished and field installed by the Temperature Control Contractor.

1.03 SUBMITTALS

A. Provide dimensional drawings and product data on each VAV box.

B. Provide air flows and pressure drops for each VAV box at the specified operation point.

C. Provide sound power readings for the eight octave bands, decibels, and sones.

D. Provide manufacturer's certification that VAV boxes are licensed to bear ARI seal for sound and air performance.

E. Installation, Operation, and Maintenance Manual (IOM): Provide manufacturer's installation, operations, and maintenance manual, including instructions on installation, operations, maintenance, receiving, handling, storage, safety information and cleaning. Provide a troubleshooting guide, parts list, warranty and electrical wiring diagrams.

1.04 QUALITY ASSURANCE

A. Performance ratings: Conform to ARI standard 880.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer’s original, unopened containers and packaging, with labels clearly indicating manufacturer, material, products included, and location of installation.

B. Storage: Store materials in a dry area indoor, protected from damage, and in accordance with manufacturer’s instructions. For long term storage follow manufacturer's Installation, Operations, and Maintenance Manual. Inlet and outlet duct connections along with piping connections shall be provided with temporary caps or covers to prevent entry of dirt and moisture.

C. Handling: Handle and lift fans in accordance with the manufacturer’s instructions. Protect materials and finishes during handling and installation to prevent damage. Follow all safety warnings posted by the manufacturer.

1.06 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

1. The warranty of this equipment is to be free from defects in material and workmanship for a period of one year from the date of occupancy.

PART 2 PRODUCTS

2.01 Variable volume medium velocity control box shall be Titus Type DESV.

2.02 Unit shall have factory catalogued performance ratings which conform to CFM, static pressure, discharge and radiated sound power and attenuation designated.

A. Cabinet shall be constructed of not lighter than 22 gauge, zinc-coated steel. (Without factory-applied enamel paint finish.) All terminal units must have an approved non-porouos sealed lining system. Liner and insulation must meet requirements of UL 181 and NFPA 90A. All seams and cut edges must be sealed to prevent erosion while all discharge edges of the liner must be secured with metal brackets. Insulation shall be 4.0 lb/ft3 density. Lining shall be Fiber-Free Lining System by Titus or equivalent. Liners made by Mylar, Tedlar, Silane or woven fiberglass cloth are not acceptable.

B. Refer to schedule on Drawings for minimum airflows.

C. Performance of units shall be based on tests conducted in accordance with ADC Standard 1061Rs and ASHRAE Standard 36B.

D. Electronic operator shall be furnished and field mounted on boxes by The Contractor.

E. Leakage of valves in fully closed position shall not exceed 2% of rated capacity at 4" w.g.

F. Automatic damper operators shall be factory installed and thoroughly tested for proper performance.

G. Minimum inlet SP requirement shall not exceed 0.50".

2.03 The Control Contractor shall field mount and wire the DDC controllers and actuators for the VAV box.

2.04 Units shall be UL listed with a flame spread rating not to exceed 25 and a smoke development rating not in excess of 50.

2.05 Box shall be factory adjusted to deliver the specified air quantities within 5%. Each box shall be labeled with the capacity as adjusted and furnished with a calibration chart. Pressure taps shall be provided to measure pressure drop across unit to confirm CFM.

2.06 Box shall be end outlet.

2.07 Box shall deliver the air quantities shown on the Drawings at sound levels not to exceed the manufacturer's published sound levels for the units indicated on the Drawings.

2.08 Box shall be furnished with a minimum 2-row reheat coil with aluminum fins and copper tubes. Provide access door in VAV box upstream of coil.

2.09 All boxes shall be furnished with an attenuator section.

2.10 All boxes shall be furnished with a discharge air sensor. Each sensor shall be provided and installed by the Temperature Control Contractor.

2.11 Variable Air volume boxes by Kreuger, or Price, meeting all specified requirements, may be furnished at the Contractor’s option.

PART 3 EXECUTION

3.01 Provide flexible connection at inlet to the box. Box shall be installed with at least two duct diameters of rigid straight duct attached directly to box inlets.

3.02 Support the units from the building structure with solid steel hanger rods or sheet metal strap hangers from corner points of unit, minimum 4, such that unit is self-supporting. Units shall not be supported from the duct system or piping system or ceiling suspension system.

3.03 The air control terminal box locations must be coordinated with all elements that shall be in or above the ceiling. This includes but is not limited to HVAC piping, plumbing piping, conduit, wiring, junction boxes, pull boxes, lighting fixtures, sprinkler heads, cable tray, speakers, smoke detectors air devices, etc. In no case shall the HVAC Contractor mount an air control terminal above a lighting fixture, speaker, diffuser or any other

device mounted on the ceiling without written permission from the University. Provide ceiling access panels where the ceiling system does not afford ready access.

3.04 Provide a manual air vent at the coil.

3.05 Operating sequence of boxes shall be as described under Section 25 00 00 – TEMPERATURE CONTROLS.

3.06 Low voltage power and communications wiring shall be by the Temperature Control Contractor.

END OF SECTION

SECTION 23 37 00

REGISTERS, GRILLES AND DIFFUSERS

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 31 13.13 - LOW PRESSURE DUCTWORK

1.02 SCOPE

A. Furnish and install registers, grilles, diffusers and appurtenances.

PART 2 PRODUCTS

2.01 SQUARE CEILING SUPPLY AIR DIFFUSERS

A. Adjustable air pattern steel square ceiling diffusers with round neck. Air pattern to be adjustable from full horizontal to full vertical.

1. Titus TMSA with Border Type 3 frame to fit into lay-in ceiling grid.

2.02 RETURN AND EXHAUST AIR GRILLES

A. Grilles with curved horizontal face bars, fixed at 45 degrees.

1. Titus 350RL, steel, surface mounted.
2. Titus 350RL, steel, lay-in.

2.03 LINEAR CEILING SUPPLY AIR DIFFUSERS

A. Extruded aluminum straight line diffusers with concealed keyways and alignment clips. Number of slots, direction of throw, size and capacities as shown on the Drawings. Install manual dampers in branch ducts to linear diffusers. Units shall have integral volume and pattern control. Air pattern to be adjustable from full horizontal to full vertical. Pattern controllers must be capable of shut-off for each slot.

1. Titus ML, Adjustable throw.

2.04 Registers, grilles and diffusers by Anemostat, Price or Krueger of the same type, size and meeting other specified requirements may be furnished at the Contractor's option.

PART 3 EXECUTION

3.01 All steel grilles and registers shall be furnished with factory prime coat of paint. Outlets in ceilings shall be furnished with factory white finish unless otherwise noted.

3.02 Diffusers in ceilings shall have flush appearance and shall initially be set by Mechanical Contractor for horizontal air pattern distribution.

3.03 Manufacturer's drawings shall include the "K" factor for use with an Alnor velometer for each size and type of register, grille and diffuser furnished.

3.04 Furnish frames and trim compatible with existing ceilings.

3.05 All diffusers shall be installed with equalizing grid.

3.06 Provide additional support hangers for grilles and registers mounted in lay-in ceiling tiles.

END OF SECTION

SECTION 25 00 00

TEMPERATURE CONTROLS (For Reference Only)

PART 1 GENERAL

1.01 REFERENCES

A. Section 23 01 05, Paragraph 1.4 - OHIO ENERGY CODE
B. Section 23 05 13 - ELECTRICAL WORK
C Section 23 36 16 - MEDIUM VELOCITY VAV/CV BOXES
D. Section 23 37 00 - REGISTERS, GRILLES AND DIFFUSERS

1.02 SCOPE

A. All temperature control systems shall be provided under a separate contract and are not part of the HVAC contract. The contractor shall provide support for the BAS Contractor for installation of control valves, dampers, VAV Box Controllers, etc. as defined in Paragraph “D” below.

B. Furnish and install a complete Direct Digital Control (DDC) Temperature Control System basis for design is Siemens Building Technologies, to automatically control the operation of the entire Heating, Ventilating and Air Conditioning System. Failure to mention any specific item or device does not relieve the Contractor of the responsibility for installing such device or item in order to comply with the intent of the Drawings or this Specification. The temperature control system shall be fully integrated into the existing Campus System such that complete control, monitoring, programming, etc. can be performed from the existing campus operator workstations at the Cole Services Building and Mosler Hall.

1. All temperature control systems shall be provided under a separate contract and are not part of the HVAC contract.

2. The existing Miami University automation system consists of an APOGEE System 600 server and multiple client workstations that perform a variety of specific monitoring, programming, and alarm notification functions. New APOGEE System 600 panels shall be provided where necessary to accomplish the operating sequences described in this Section. Existing APOGEE System 600 panels currently located in the third floor Mechanical Room of Williams Hall shall be reused if possible. All new systems associated with this project shall directly interface with the existing systems in a seamless manner to support the following functionality:

a) Monitor/Command all physical and virtual points.

b) System network and hardware diagnostics.

c) Programming - all editing functions.

d) Dynamic and historical trending - automatic data collection.

e) Automatic database back-up/reload.

f) Time-clock synchronization

g) Alarm routing

h) Time of day scheduling

C. Building Automation System (BAS) installer shall provide:

1. A fully integrated building automation system (BAS) as manufactured by Siemens Building Technologies, UL listed, incorporating direct digital control (DDC) for energy management, equipment monitoring and control, including color graphic workstations.

2. Complete temperature control system to be DDC as specified herein.

3. All wiring, conduit, panels, for all DDC temperature controls.

4. All final electrical connections to the new DDC Controller. Pick up power immediately inside of panel.

5. BAS installer shall be responsible for all electrical work associated with the BAS control system and as called for on the Drawings.

a) Perform all wiring in accordance with all local and national codes.

b) Install all line voltage wiring, concealed or exposed, in accordance with Division 16.

c) BAS Contractor shall provide 120 volt, 20 amp circuits and circuit breakers from the existing normal power panel for direct digital control systems.

d) Surge transient protection shall be incorporated in design of system to protect electrical components in all DDC Controllers.

e) All 120V and low voltage electrical control wiring throughout the building whether exposed or concealed shall be run in conduit in accordance with Division 16.

f) All 24V power shall be by the BAS installer and the The contractor.

6. BAS installer shall furnish and install all control damper and control valve actuators, including plenum and/or duct reinforcements where required.

7. BAS installer shall furnish and field install all VAV box controllers and actuators.

8. BAS Graphics for all new and modified HVAC equipment installed under this contract.

D. The contractor provides:

1. All wells and openings for water monitoring devices, differential pressure switches and alarms furnished by BAS installer.

2. Installation of control valves.

3. Installation of openings for air flow monitoring devices, for differential pressure switches furnished by BAS installer.

E. Electrical Contractor provides:

1. Power circuit to junction box within 5 feet of equipment for stand-alone control panels indicated on the Drawings; installed and connected by BAS Contractor.

2. 120 volt, 20 amp breaker for each DDC Controller.

F. BAS Installer shall provide programming modifications necessary to fine tune sequences during commissioning of systems at no additional cost to the University.

1.03 GENERAL PRODUCT DESCRIPTION:

A. The building automation system (BAS) shall integrate multiple building functions including equipment supervision and control, alarm management, energy management and historical data collection.

B. The building automation system shall consist of the following:

1. Stand-alone DDC Controller

C. The system shall be modular in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, DDC Controllers and operator devices.

D. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. The DDC Controller shall operate independently by performing its own specified control, alarm management, operator I/O and data collection. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

E. DDC Controller shall be able to access any data from, or send control commands and alarm reports directly to, any other DDC Controller or combination of controllers on the network without dependence upon a central processing device. DDC Controller shall also be able to send alarm reports to multiple operator workstations without dependence upon a central processing device.

1.04 QUALITY ASSURANCE

A. Materials and equipment shall be the catalogued products of the BAS manufacturer and shall be the manufacturer's latest standard design that complies with the specification requirements.

B. Install system using competent workmen who are fully trained in the installation of building automation system equipment.

C. Single source responsibility of supplier shall be the complete installation and proper operation of the BAS and control system and shall include debugging and proper calibration of each component in the entire system. This shall include assisting the chemical treatment supplier in the proper operation and calibration of all components associated with the condenser water chemical treatment system.

D. Supplier shall have an in-place support facility within 100 miles of the site with technical staff, spare parts inventory and all necessary test and diagnostic equipment.

E. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Section 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.

F. BAS shall comply with UL 916 PAZX ,UL 864 UUKL, and be so listed at the time of bid.

G. Design and build all system components to be fault-tolerant.

1. Satisfactory operation without damage at 110% and 85% of rated voltage and at plus 3 Hertz variation in line frequency.

2. Static, transient and short-circuit protection on all inputs and outputs.

3. Protect communication lines against incorrect wiring, static transients and induced magnetic interference.

4. Network-connected devices to be A.C. coupled or equivalent so that any single device failure will not disrupt or halt network communication.

5. All real time clocks and data file RAM to be battery-backed for a minimum 72 hours and include local and system low battery indication.

6. All programs shall retain their memory for a minimum of 7 days upon loss of power.

1.05 SUBMITTALS - REVIEW

A. Manufacturer's Product Data:

1. All equipment components

B. Shop Drawings:

1. System wiring diagrams with sequence of operation for each system as specified.

2. Submit manufacturer's product information on all hardware items along with descriptive literature for all software programs to show compliance with specifications.

3. System configuration diagram showing all panel types and locations as well as communications network and workstations.

1.06 SUBMITTALS - INFORMATIONAL

A. Where installation procedures, or any part thereof, are required to be in accord with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the A/E prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received.

1.07 SYSTEM CHECK-OUT

A. Provide necessary personnel as required to assist the University and A/E in providing complete system operational testing.

PART 2 PRODUCTS

2.01 NETWORKING COMMUNICATIONS

A. The design of the BAS shall network operator workstations and stand-alone DDC Controllers. The network architecture shall consist of two levels, a high performance peer-to-peer network and DDC Controller specific local area networks. The new DDC controller for this project shall connect to the existing campus network.

B. Access to system data shall not be restricted by the hardware configuration of the building automation system. The hardware configuration of the BAS network shall be totally transparent to the user when accessing data or developing control programs.

C. Peer-to-Peer Network Level:

1. Operator workstations and DDC Controllers shall directly reside on a network such that communications may be executed directly between DDC Controllers, directly between existing workstations and between DDC Controllers and existing workstations on a peer-to-peer basis.

2. All operator devices either network resident or connected via dial-up modems shall have the ability to access all point status and application report data or execute control functions for any and all other devices via the peer-to-peer network. Access to data shall be based upon logical identification of building equipment. No hardware or software limits shall be imposed on the number of devices with global access to the network data.

3. Network design shall include the following provisions:

   a. Provide high-speed data transfer rates for alarm reporting, quick report generation from multiple controllers and upload/download efficiency between network devices. System performance shall insure that an alarm occurring at any DDC Controller is displayed at existing workstation and/or alarm printer within 5 seconds.

   b. Support of any combination of DDC Controllers and operator workstations directly connected to the peer-to-peer network. A minimum of 30 devices shall be supported on a single network.

   c. Message and alarm buffering to prevent information from being lost.

   d. Error detection, correction and retransmission to guarantee data integrity.

   e. Synchronization of real-time clocks, to include automatic daylight savings time updating between all DDC Controllers shall be provided.

D. DDC Controller Local Area Network (LAN):

1. This level communication shall support a family of application specific controllers and shall communicate bi-directionally with the peer-to-peer network through DDC Controllers for transmission of global data.

2.02 DDC CONTROLLER

A. Stand-alone Controller shall be microprocessor-based with a minimum word size of 16 bits. They shall also be multi-tasking, multi-user, real-time digital control processors consisting of modular hardware with plug-in enclosed processors, communication controllers, power supplies and input/output point modules. Controller size shall be sufficient to fully meet the requirements of this specification and the attached point list.

B. The DDC Controller shall have sufficient memory, to support its own operating system and databases, including:

1. Control processes

2. Energy management applications

3. Alarm management applications including custom alarm messages for each level alarm for each point in the system.

4. Historical/trend data for points specified

5. Maintenance support applications

6. Custom processes

7. Operator I/O

8. Dial-up communications

9. Manual override monitoring

C. Each DDC Controller shall support:

1. Monitoring of the following types of inputs, without the addition of equipment outside the DDC Controller cabinet:

a. Analog inputs

1) 4-20 mA
2) 0-10 Vdc
3) Thermistors
4) 1000 ohm RTDs
5) Conductivity Sensor (0-6000 micromho/cm)

b. Digital inputs

1) Dry contact closure
2) Pulse Accumulator
3) Voltage Sensing

2. Direct control of pneumatic and electronic actuators and control devices. Each DDC Controller shall be capable of providing the following control outputs:

a. Digital outputs (contact closure)

1) Contact closure (motor starters, sizes 1-4)

b. Analog outputs

1) 0-20 psi
2) 4-20 mA
3) 0-10 Vdc

D. Each DDC Controller shall have a minimum of 10 per cent spare capacity for future point connection. The I/O points in the panel shall be modular plug-in type. No spare point will be furnished, but the panel shall have the spare capability mentioned above. The type of future points shall be in the same proportion as the implemented I/O functions of the panel, but in no case shall the panel be capable of less than two spares of each implemented I/O type. Provide all processors, power supplies, communication controllers and point modules to patch implemented types so that the implementation of a point only requires the addition of the appropriate point, wiring, software and the end device (sensor, actuator, etc.).

1. Provide sufficient internal memory for the specified control sequences and have at least 25% of the memory available for future use.

E. DDC Controllers shall provide at least two RS-232C serial data communication ports for operation of operator I/O devices such as industry standard printers, operator terminals, modems and portable laptop operator's terminals. DDC Controllers shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers or terminals.

F. The operator shall have the ability to manually override automatic or centrally executed commands at the DDC Controller via local, point discrete, on-board hand/off/auto operator override switches for digital control type points and gradual switches for analog control type points. These override switches shall be operable whether the panel processor is operational or not.

1. Switches shall be mounted either within the DDC Controllers key-accessed enclosure, or auxiliary control panel to prevent unauthorized overrides.

2. DDC Controllers shall monitor the status of all overrides and inform the operator that automatic control has been inhibited. DDC Controllers shall also collect override activity information for reports.

G. DDC Controllers shall provide local LED status indication for each digital output for constant, up-to-date verification of all point conditions without the need for an operator I/O device.

H. Each DDC Controller shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all panel components. The DDC Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication.

I. Isolation shall be provided at all peer-to-peer network terminations, as well as all

field point terminations to suppress induced voltage transients consistent with IEEE Standards 587-1980.

J. In the event of the loss of normal power, there shall be an orderly shutdown of all DDC Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 7 days.

1. Upon restoration of normal power, the DDC Controller shall automatically resume full operation without manual intervention.

2. Should DDC Controller memory be lost for any reason, the user shall have the capability of reloading the DDC Controller via the local RS-232C port, via telephone line dial-in or from a network workstation PC.

2.03 DDC CONTROLLER RESIDENT SOFTWARE FEATURES

A. General:

1. All necessary software to form a complete operating system as described in this specification shall be provided.

2. The software programs specified in this Section shall be provided as an integral part of DDC Controllers and shall not be dependent upon any higher level computer for execution.

B. Control Software Description:

1. The DDC Controllers shall have the ability to perform the following pre-tested control algorithms:

a. Two-position control

b. Proportional control

c. Proportional plus integral control

d. Proportional, integral, plus derivative control

2. Control software shall include a provision for limiting the number of times each piece of equipment may be cycled within any one-hour period.

3. The system shall provide protection against excessive demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical loads.

4. Upon the resumption of normal power, each DDC Controller shall analyze the status of all controlled equipment, compare it with normal occupancy scheduling and turn equipment on or off as necessary to resume normal

operations.

C. DDC Controllers shall have the ability to perform all the following energy management routines:

1. Time-of-day scheduling
2 Calendar-based scheduling
3. Holiday scheduling
4. Temporary schedule overrides
5. Start-Stop Time Optimization
6. Automatic Daylight Savings Time Switchover
7. Night setback control
8. Enthalpy switchover (economizer)
9. Peak demand limiting
10. Temperature-compensated duty cycling
11. Fan speed/CFM control
12. Heating/cooling interlock
13. Cold deck reset
14. Hot deck reset
15. Hot water reset
16. Chilled water reset
17. Condenser water reset
18. Chiller sequencing

a. All programs shall be executed automatically without the need for operator intervention and shall be flexible enough to allow user customization. Programs shall be applied to building equipment as described in the Sequence of Operations.

D. DDC Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.

1. It shall be possible to use any of the following in a custom process:

a. Any system measured point data or status
b. Any calculated data
c. Any results from other processes
d. User-defined constants
e. Arithmetic functions (+, -, *, /,square root, exp, etc.)
f. Boolean logic operators (and/or, exclusive or, etc.)
g. On-delay/off-delay/one-shot timers

2. Custom processes may be triggered based on any combination of the following:

a. Time interval
b. Time-of-day
c. Date
d. Other processes
e. Time programming

f. Events (e.g., point alarms)

3. A single process shall be able to incorporate measured or calculated data from any and all other DDC Controllers on the network. In addition, a single process shall be able to issue commands to points in any and all other DDC Controllers on the network.

4. Processes shall be able to generate operator messages and advisories to operator I/O devices. A process shall be able to directly send a message to a specified device or cause the execution of a dial-up connection to a remote device such as a printer or pager.

5. The custom control programming feature shall be documented via English language descriptors.

E. Alarm management shall be provided to monitor and direct alarm information to operator devices. Each DDC Controller shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost. At no time shall the DDC Controllers ability to report alarms be affected by either operator or activity at a PC workstation, local I/O device or communications with other panels on the network.

1. All alarm or point change reports shall include the point's English language description and the time and date of occurrence.

2. The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of six priority levels shall be provided for each point. Point priority levels shall be combined with user definable destination categories (PC, printer, DDC Controller, etc.) to provide full flexibility in defining the handling of system alarms. Each DDC Controller shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point.

3. Alarm reports and messages will be directed to a University-defined list of operator devices or PCs.

4. In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a minimum 80 character alarm message to more fully describe the alarm condition or direct operator response.

a. Each DDC Controller shall be capable of storing a library of at least 50 alarm messages. Each message may be assignable to any number of points in the Controller.

5. In dial-up applications, operator-selected alarms shall initiate a call to a remote operator device.

F. A variety of historical data collection utilities shall be provided to manually or automatically sample, store and display system data for points as specified in the I/O summary.

1. DDC Controllers shall store point history data for selected analog and digital inputs and outputs:

a. Any point, physical or calculated may be designated for trending. Any point, regardless of physical location in the network, may be collected and stored in each DDC Controllers point group. Two methods of collection shall be allowed: either by a pre-defined time interval or upon a pre-defined change of value. Sample intervals of l minute to 7 days shall be provided. Each DDC Controller shall have a dedicated RAM-based buffer for trend data.

2. Trend data shall be stored at the DDC Controllers and uploaded to the workstation when retrieval is desired. Uploads shall occur based upon either user-defined interval, manual command or when the trend buffers are full. All trend data shall be available for use in 3rd party personal computer applications.

G. DDC Controllers shall automatically accumulate and store run-time hours for digital input and output points as specified in the point I/O summary.

1. The totalization routine shall have a sampling resolution of one minute or less.

2. The user shall have the ability to define a warning limit for run-time totalization. Unique, user-specified messages shall be generated when the limit is reached.

H. DDC Controllers shall automatically sample, calculate and store consumption totals on a daily, weekly or monthly basis for user-selected analog and digital pulse input type points as specified in the point I/O summary.

1. Totalization shall provide calculation and storage of accumulations of up to 99,999.9 units (e.g., KWH, gallons, BTU, tons, etc.).

2. The totalization routine shall have a sampling resolution of one minute or less.

3. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.

I. DDC Controllers shall have the ability to count events such as the number of times a pump or fan system is cycled on and off. Event totalization shall be performed on a daily, weekly or monthly basis for points as specified in the point I/O summary.

1. The event totalization feature shall be able to store the records associated with a minimum of 9,999.9 events before reset.

2. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.

J. Color Graphics Software

The vendor shall, as part of the project, provide all necessary hardware and software required to integrate color graphic representatives of HVAC systems into the existing campus graphics software. All graphics for this project shall be consistent with existing Miami University graphics. Provide color graphics for the following systems/equipment as a minimum:

1. New VAV Boxes
2. Finned Radiation

2.04 PRODUCTS

A. Valves (Throttling Plugs): General Design - All valves shall be equipped with throttling plugs and removable composition discs. All valves are to be sized by the control manufacturer and he shall submit pressure drop calculation and guarantee sufficient size to meet the requirements of the equipment being served. Valve operators shall be of such design so as to provide adequate operating power for valve positioning at full pump head. Valve operators shall be electronic type. All valves are to be equipped with U cup silicone packing. Pressure drop through valves shall not exceed 10 feet for modulating control.

B. Three-Way Valves: Three-way valves are to be of the three port mixing type designed expressly for mixing of two inlets and providing a common outlet. The use of reverse piped diverting valves will not be acceptable. The control manufacturer will be responsible to the The contractor relative to notification as to correct method of piping of all three-way valves.

C. Temperature Sensors: Each temperature sensor shall match the requirements of the associated temperature controller. Each sensor shall be designed for the appropriate application (i.e., duct, immersion, etc.) and be provided with all necessary installation accessories. Ranges shall be selected to the middle of the control range.

PART 3 EXECUTION

3.01 WIRING AND CONDUIT

A. All control wiring incidental to the Building Automation System shall be by the Building Automation Manufacturer except as follows:

1. Line voltage thermostats shall be turned over to the Electrical Contractor for installation and wiring.

2. Wiring shown on the Electrical Contract Drawings shall be wired by the Electrical Contractor.

B. All temperature control panels shall be completely prewired by the Temperature Control Manufacturer to terminal strips within the control cabinet. Provide 20 amp toggle switch to disconnect power at each panel. All internal interlock wiring within the control panel shall be complete to the terminal strips.

C. All wiring, including low voltage, shall be installed in conduit. All wiring, conduit and installation shall be in accordance with the latest edition of the National Electrical Code and the requirements of Division 16 Electrical Specification, except low voltage wiring may be of the type and size recommended by the Building Automation Manufacturer.

D. All conduit and conduit installation, including conduit utilized for plastic pneumatic tubing, shall be in accordance with the requirements of Division 16, Electrical Specification.

3.02 BUILDING AUTOMATION SYSTEM DIAGRAMS

A. Complete Building Automation System diagrams including motor control schematics, wiring diagrams and a written description of the system operation shall be provided by the Building Automation System Installer. Diagrams shall include face elevations of the temperature control panels.

B. Prepare, as a part of Building Automation System shop drawings, complete terminal-to-terminal wiring diagrams. These will show terminal designations on control items and equipment. Wiring diagrams to be compatible with Electrical Drawings.

C. The Control diagrams, along with product literature on all system components shall be submitted as "Shop Drawings" for review by the A/E prior to starting work. Submit two sets of drawings for "preliminary" review before making a formal submittal.

D. Control diagrams, laminated in plastic or in full size heavy plastic binders with mounting rings, shall be hung adjacent to each control panel showing all schematic diagrams and descriptions related to the systems served by that panel.

E. Furnish four (4) complete sets of Operating and Maintenance Instructions for Temperature Controls, including control diagrams, to the contractor for inclusion in the "Operating and Maintenance Manuals". Record control drawings must show set points and spring ranges.

3.03 CALIBRATION

A. Inasmuch as controllers are factory calibrated and controlled devices have nominal operating ranges, different from actual field conditions, all controllers shall be calibrated and set for the actual field conditions. A listing of actual

spring ranges on controlled devices such as for valves, etc., shall be submitted to the University's Operating Engineer in the Operating and Maintenance Manual, for future recalibration/maintenance.

3.04 SUPERVISION

A. All temperature controls shall be installed, and calibrated under the supervision of a qualified representative of the Building Automation System Manufacturer. The Building Automation System Manufacturer shall certify in writing the qualification of the installing company.

3.05 SEQUENCES

A. DDC Controlled Variable Volume Box with Hot Water Reheat Control (VVR)

1. The room temperature sensor and associated box mounted controller and damper actuator shall be provided by the The contractor. Box controllers and actuators shall be furnished and field installed by the The contractor.

   The heating water control valve shall also be provided by the Contractor and furnished to the contractor for installation.

2. The terminal box shall have an occupied and unoccupied sequence of operation as described herein. Each terminal box shall be indexed between the occupied and unoccupied cycle in conjunction with the existing air handling unit supplying the terminal box.

3. During the occupied sequence of operation, the terminal box controller and actuator shall modulate the box damper to the box minimum airflow position (30%) as the room temperature decreases. On a requirement for heat to maintain space temperature setpoint, the controller shall modulate the reheat coil control valve through the valve electric actuator.

   Temperature sensors for terminal box control shall have no temperature setpoint adjustment capability. All space temperature adjustment shall be made by operation’s station. The contractor shall be responsible for meeting with the University’s Facility Manager to determine the appropriate temperature adjustment range.

   a. VVR boxes serving offices shall be controlled by the room vacancy sensors to go to minimum whenever the room is vacant for more than 30 minutes (adjustable). Vacancy sensor provided by the Electrical Contractor.

   b. VVR Boxes serving multiple offices or spaces shall have averaging sensors for control of each space.

4. Heating, Cooling and Dehumidification During the Associated Air Handling Unit Unoccupied Cycle:

Heating Cycle: The DDC system shall monitor the terminal box temperature sensors and cycle the air handling unit supplying the terminal box through the air handling unit controller to maintain a minimum space temperature. When the air handling unit is operating in the unoccupied heating cycle, the terminal box controller shall modulate the primary air damper to maintain 75% of the maximum volume of airflow as scheduled on the Drawings and the reheat coil control valve shall be modulated.

Cooling Cycle: The DDC system shall monitor the terminal box temperature sensors and cycle the air handling unit supplying the terminal box through the air handling unit controller to maintain a maximum space temperature. When the air handling unit is operating in the unoccupied cooling cycle, the terminal box controller shall modulate the primary air damper to maintain 75% of the maximum volume of airflow as scheduled on the drawings and the reheat coil control valve shall be closed.

5. Heating During the Associated Air Handling Unit Morning Warm-Up Cycle:

   The DDC system shall initiate the air handling unit to a timed morning warm-up cycle prior to the start of the scheduled occupied cycle. When the air handling unit is operating in the warm-up cycle, the terminal box controller shall modulate the primary air damper to maintain 75% of the maximum volume of airflow as scheduled on the Drawings and the reheat coil control valve shall be modulated. When the DDC system indexes the air handling unit from the warm-up cycle to the occupied cycle, the terminal box shall also be indexed to occupied cycle control.

6. The terminal box damper actuator and heating coil control valve shall fail to last position on a loss of power to the controller.

7. Each terminal box shall have a separate space temperature sensor unless otherwise shown on the drawings.

8. Terminal boxes serving more than one space shall average the inputs from all sensors and use the average value to control the box. In areas with occupancy sensors, when it is determined the space is not occupied, the inputs from the space sensor of the unoccupied zones shall not be used.

9. The contractor shall connect to 120V junction boxes as shown on the drawings and provided by the Electrical Contractor and provide transformers as required for box power. All wiring and transformers from the junction boxes to the terminal boxes shall be by the contractor.

10. Box controller shall provide supply air volume in CFM, supply air temperature, space temperature, and space temperature setpoint at the

operator's terminal.

11. VAV box shall be interlocked with the vacancy sensor provided by the Electrical Contractor for occupancy control. Wiring between the vacancy sensor and the DDC Controller shall be by the contractor. The BAS shall index the VAV box to unoccupied mode when the room is unoccupied.

B. Finned Radiation Control

1. The contractor shall provide a new electric actuated control valve for the existing finned radiation. The finned radiation shall be controlled from the new VAV box controller.

2. The finned radiation control valve shall be modulated to maintain the space temperature on a call for heat in conjunction with the VAV box reheat coil.

3.06 ON-SITE TESTING

A. Provide University-approved operation and acceptance testing of the complete system. The University will witness all tests.

B. Field Test: When installation of the system is complete, calibrate equipment and verify transmission media operation before the system is placed on-line. All testing, calibrating, adjusting and final field tests shall be completed by the installer. Provide a detailed cross-check of each sensor within the system by making a comparison between the reading at the sensor and a standard traceable to the National Bureau of Standards. Provide a cross-check of each control point within the system by making a comparison between the control command and the field-controlled device. Verify that all systems are operable from local controls in the specified failure mode upon panel failure or loss of power. Submit the results of functional and diagnostic tests and calibrations to the Engineer for final system acceptance.

3.07 SERVICE AND GUARANTEE

A. General Requirements: Provide all services, materials and equipment necessary for the successful operation of the entire BAS system for a period of one year after completion of successful performance test. Provide necessary material required for the work. Minimize impacts on facility operations when performing scheduled adjustments and non-scheduled work.

B. Systems Modifications: Provide any recommendations for system modification in writing to Owner. Do not make any system modifications, including operating parameters and control settings, without prior approval of Owner. Any modifications made to the system shall be incorporated into the operations and maintenance manuals, and other documentation affected.

C. Software: Provide all software updates and verify operation in the system. These updates shall be accomplished in a timely manner, fully coordinated with

the system operators, and shall be incorporated into the operations and maintenance manuals, and software documentation.

3.08 TRAINING

A. The Contractor shall provide competent instructors to give full instruction to designated personnel in the adjustment, operation and maintenance of the system installed rather than a general training course. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach.

B. Provide 2 hours of training for University's operating personnel. Training shall include:

1. Explanation of drawings, operations and maintenance manuals
2. DDC Controller operation/function
3. Operator control functions including graphic generation and field panel programming
4. Explanation of adjustment, calibration and replacement procedures

END OF SECTION

ELECTRICAL SPECIFICATIONS

INDEX

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies the basic requirements for electrical installations and includes requirements common to Division 22, Division 23, more than one section of Division 26, Division 27, Division 28, Division 33, and Division 34. It expands and supplements the requirements specified in sections of Division 01.

B. Codes and Standards: All equipment, material and installations shall comply with applicable codes, Miami University Design Standards, and installation practices. Comply with the requirements of the applicable local building code, the applicable NEC, all local rules and regulations including those of the fire authorities. Comply with all applicable NFPA standards. All material and equipment shall be listed by the Underwriters Laboratories (UL) standard that is applicable for the specific purpose of the material and equipment. The National Electrical Code, National Electrical Manufacturer's Association (NEMA) Standards, and applicable ANSI and IEEE standards shall apply to the pertinent materials, equipment, and installation practices. Testing shall be in accordance with the applicable International Electrical Testing Association (NETA) standards.

C. Permits and Fees: Obtain all permits and inspections required by all laws and regulations or public authority having such jurisdiction. File drawings necessary to obtain permits. Miami University will pay for all permits. Coordinate payment with the University's Project Manager.

D. Coordinate installation, equipment and manufacturers, within all Specifications Sections, with Miami University Design Standards manual.

1.2 INSPECTIONS

A. Obtain all inspections required by all laws, ordinances, rules, regulations or public authority having jurisdiction and obtain certificates of such inspections and submit same to the Engineer. Pay all fees, charges and other expenses in connection therein.

B. Before any electrical work is covered, the Engineer will inspect the electrical work completed at that time.

C. Final Inspection - When the Contractor determines all work is completed and working properly per the Contract Documents, the contractor shall request a "Final" inspection

by the Engineer in writing. If more than one re-inspection is required after this final inspection, the Contractor shall bear all additional costs, including compensation for the Engineer additional services made necessary thereby. A final inspection will not be made until Operating and Maintenance Manuals and Test Reports are submitted and approved and all prior "Observation report" punch lists are completed, signed and returned to the Engineer.

D. All work shall be inspected by the local authority having jurisdiction and upon completion of the work, the Electrical Contractor shall furnish to the State Architect, a certificate of inspection and approval from said Department before final payment on the Contract will be allowed. Fee for inspections shall be a part of this Contract.

1.3 OBSERVATION REPORTS

A. During the course of construction, the Engineer will prepare "Observation Reports" with a list of items found to be in need of correction. All items listed shall be corrected by the Contractor. A space is provided on the form for the Contractor to note the completion of each item. All prior "Observation Report" items must be completed, the lists signed and returned to the Engineer prior to making the final inspection. After the final list is issued, the same procedure will apply

1.4 TESTS

A. Refer to section 26 08 00, Commissioning.

B. When the Engineer makes final inspection of all electrical work he will order tests performed as deemed necessary. These tests may include operation of lights and equipment, continuity of conduit system, grounding resistances and insulation resistances and checking out the operation of the various systems. This Contractor shall provide such assistance as required (including manpower and tools) to start and stop the various systems, etc. and simulate control sequences. The Contractor (not the Engineer) is responsible to turn on the systems and demonstrate they are operating properly.

C. Submit data taken during such test to Engineer. Pay all professional engineering fees involved in required testing of equipment.

D. All signaling systems, such as fire alarm shall be checked out and tested by a qualified field representative of equipment vendor. A report shall be submitted to Engineer by vendor representative indicating results of such final check out and test. Final payment will not be approved until such report is submitted.

E. If the Engineer determines that any work requires special inspection, testing, or approval which Part 3 - Execution does not include, he will, upon written authorization from the University, instruct the Contractor to order such special inspection, testing or approval. The Contractor shall give timely notice so the Engineer may observe the inspections, tests or approvals. If such special inspection or testing reveals a failure of the work to comply with the requirements of the Contract Documents, the Contractor

shall bear all costs thereof, including compensation for the Engineer additional services made necessary by such failure; otherwise the University shall bear such costs, and an appropriate Change Order shall be issued.

F. Work shall be unacceptable when found to be defective or contrary to the Plans, Specifications, Codes specified or accepted standards of good workmanship.

G. The Contractor shall promptly correct all work found unacceptable by the Engineer whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such unacceptable work, including compensation for the Engineer additional services made necessary thereby.

1.5 SEISMIC REQUIREMENTS

A. Conform to requirements in Section 20 08 00 "Seismic Protection," including required submittals described under Section 20 08 00.

1.6 ELECTRICAL SUBMITTALS

A. General: Submittals are not requested for all products covered in the specifications. Submit only the data requested under the submittals portion of each specification section. Un-requested submittals will not be processed or reviewed. FAX or photo copies are not allowed as submittals for operating and maintenance manuals. Submittals for operating and maintenance manuals must be on original manufacturer printed stock. Non-requirement of submittals, when so noted, is not to be construed as an allowance for substitutions and does not relieve the contractor from full compliance with the plans and specifications. Any deviation from specified items is considered a substitution. If the contractor desires to use other than specified items, then a formal request for substitution must be submitted prior to bid date, in accordance with the methods and times indicated in these specifications.

B. Before submitting a shop drawing or any related material to the Engineer, Contractor shall: review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of the Contractor; approve each such submission before submitting it; and so stamp each such submission before submitting it.

C. Definitions:
   1. Product Data: Pre-printed manufacturer's data.
   2. Shop Drawings: Drawings made specifically for the manufacture of a particular piece of equipment to be used on this project.
   3. Operation and Maintenance Data: Information containing instructions on the proper operation, maintenance and repair of the equipment, complete with written text, diagrams, photos, exploded views and parts lists.
   4. Record Documents: Information indicating the actual installed conditions of the project on Mylar, electronic media, photographs or typed paper. Submit type, quantities and on media specified where indicated to be submitted.

1.7 DRAWINGS AND SPECIFICATIONS

A. The architectural, structural, mechanical, and electrical drawings and specifications shall be considered as mutually explanatory and complementary. Any electrical work called for by one and not by the other shall be performed as though required by all. All sections and subsections of the Electrical work shall be governed by and subject to the general and supplementary conditions. Any discrepancies in or between the drawings and specifications, or between the drawings and actual field conditions shall be reported to the Engineer/Architect in sufficient time to issue an addendum for clarification.

B. The electrical drawings are diagrammatic, and some circuit runs have been distorted to avoid confusion of lines. However, the drawings indicate the general layout of the complete electrical system. Field verification of scale dimensions on plans is directed since actual locations, distance, and levels will be governed by actual field conditions.

1.8 PRODUCT OPTIONS AND SUBSTITUTIONS

A. When two or more items of same material or equipment are required they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, wire, conduit, fittings, sheet metal, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in Work, except as otherwise indicated.

B. Provide products which are compatible within systems and other connected items.

C. Substitutions: Products other than those specified must be submitted as a substitution, at least 15 days prior to bid due date, along with a letter explaining the reason for the substitution. A sample of the proposed substitution shall be submitted to the engineer for the engineer's evaluation when requested by the engineer. This sample shall be supplied at no cost to the engineer, and will be returned to the contractor, at the contractor's expense, at the end of the evaluation period. Substitutions will only be evaluated and considered by the engineer when the engineer's time for such evaluation is paid for by the contractor requesting the substitution. Delivery time problems due to the contractor's failure to order the originally specified items in a timely manner will not be considered as an acceptable reason for substitution.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling. Protect stored equipment and materials from damage.

B. Coordinate deliveries of electrical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

1.10 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 01 Section "Contract Closeout." In addition to the requirements specified in Division 01, indicate installed conditions for:
   1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
   2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
   3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
   4. Mark Drawings to indicate revisions to conduit size and location both exterior and interior; actual equipment locations, dimensioned from column lines; concealed equipment, dimensioned to column lines; distribution and branch electrical circuitry; fuse and circuit breaker size and arrangements; support and hanger details; Change Orders; concealed control system devices.
   5. Mark Specifications to indicate approved substitutions, Change Orders, actual equipment and materials used.

1.11 OPERATION AND MAINTENANCE DATA

A. Refer to the Division 01 Section: “Contract Closeout” or “Operation and Maintenance Data” for procedures and requirements for preparation and submittal of maintenance manuals.

B. In addition to the information required by Division 01 for Maintenance Data, include the following information:
   1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
   2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions, regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.
   3. Maintenance procedures for routine preventive maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
   4. Servicing instructions and lubrication charts and schedules.

1.12 WARRANTIES

A. Refer to the Division 01 Section: “Warranties” for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.

B. Compile and assemble the warranties specified in Division 26, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.

C. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

D. This Contractor is responsible for all defects, repairs and replacements in materials and workmanship, for a period of one (1) year after final payment is approved by the Engineer.

E. Product guarantees greater than one (1) year shall be passed along to the Owner for full benefit of the manufacturer's warranty.

1.13 CLEANING

A. Refer to the Division 01 Section: "Contract Closeout" or "Final Cleaning" for general requirements for final cleaning.

1.14 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Coordinate equipment rough-in requirements with Divisions 02 through 23.

1.15 ELECTRICAL INSTALLATIONS

A. Coordinate electrical equipment and materials installation with other building components.

B. Verify all dimensions by field measurements.

C. Arrange for chases, slots, and openings in other building components to allow for electrical installations.

D. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.

E. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.

F. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

G. Install systems, materials, and equipment to conform to project requirements and approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that

portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer.

H. Systems, materials, and equipment, which will be exposed in finished areas shall be installed level and plumb, parallel and perpendicular to other building systems and components.

I. Install electrical services and overhead equipment to provide the maximum headroom possible, where mounting heights are not detailed or dimensioned.

J. Install electrical equipment to facilitate maintenance and repair or replacement of equipment components. Maintain code clearances in front of and about all electrical equipment. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

K. Install electrical conduits and cabling in crawl space (interstitial space) as indicated on drawings and for lighting, fire alarm, mechanical equipment, and power circuits located in parking garage. Rough-in conduits for low voltage systems such as CCTV shall also be allowed in crawl space. All conduit and cabling routing shall be coordinated with all other trades.

L. Coordinate the installation of electrical materials and equipment above ceilings with suspension system, mechanical equipment and systems, and structural components.

M. Include in the work all labor, materials, equipment, services, apparatus, drawings (in addition to the Contract Documents) as required to complete the intended work.

N. Only new, clean and perfect equipment, apparatus, materials and supplies of latest design and manufacture shall be incorporated in the work in order to assure an electrical system of high quality.

O. The work required to be done by the contractor, the utility companies and the owner, in order to obtain utility services such as telephone and electric, is delineated in these specifications and on the drawings. Unless otherwise noted, construction or connection charges (except for temporary power) by those companies shall be paid by the Owner.

1.16 CONNECTIONS TO EQUIPMENT AND APPLIANCES

A. In many instances the drawings show an outlet box and power supply for specific equipment, be it Owner or contractor furnished. It is to be understood, unless otherwise noted, that the work includes a connection from the box to the equipment or appliance. Verify circuit conductor quantities and sizes and overcurrent device number of poles and rating as well as any special grounding requirements, for all owner furnished equipment and adjust the required work accordingly.

1.17 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 01 Section "Cutting and Patching." In addition to the requirements specified in Division 01, the following requirements apply:
   1. Perform cutting, fitting, and patching of electrical equipment and materials required to:
      a. Uncover Work to provide for installation of ill-timed Work.
      b. Remove and replace defective Work.
      c. Remove and replace Work not conforming to requirements of the Contract Documents.
      d. Remove samples of installed Work as specified for testing.
      e. Install equipment and materials in existing structures.
      f. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including, but not limited to, removal of electrical items indicated to be removed and items made obsolete by the new Work.
   2. Coordinate the cutting and patching of building components to accommodate the installation of electrical equipment and materials.
   3. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
   4. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

1.18 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer for the installation and application of sealers and access panels and access doors.

B. Fire-Resistance Ratings: Where a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in the UL "Building Materials Directory" for rating shown.

C. Provide UL Label on each fire-rated access door.

1.19 SEQUENCE AND SCHEDULING

A. Coordinate the shut-off and disconnection of electrical and communication services with the Owner and the utility companies.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS METALS

A. Steel plates, shapes, bars, and bar grating: ASTM A 36.

B. Cold-Formed Steel Tubing: ASTM A 500.

C. Hot-Rolled Steel Tubing: ASTM A 501.

D. Steel Pipe: ASTM A 53, Schedule 40, welded.

E. Non-shrink, Nonmetallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout, recommended for interior and exterior applications.

F. Fasteners: Zinc-coated, type, grade, and class as required.

2.2 MISCELLANEOUS LUMBER

A. All lumber shall be fire treated.

B. Framing Materials: Standard Grade, light-framing-size lumber of any species. Number 3 Common or Standard Grade boards complying with WCLIB or AWPA rules, or Number 3 boards complying with SPIB rules. Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent.

C. Construction Panels: Plywood panels; APA C-D PLUGGED INT, with exterior glue; thickness as indicated but not less than 15/32 inches.

2.3 Concrete Bases:

1. Concrete: Portland cement mix, 3000 psi.
2. Cement: ASTM C 150, Type I.
    a. Fine Aggregate: ASTM C 33, sand.
    b. Coarse Aggregate: ASTM C 33, crushed gravel.
3. Fabric Reinforcement: ASTM A 185, welded-wire fabric, plain.
4. Reinforcement Bars: ASTM A 615, Grade 60, deformed.
5. Provide concrete bases where shown and outlined on drawings

B. Fire-stopping materials:

1. Products: Subject to compliance with project and Underwriters Laboratories requirements, provide materials by one of the following:
    a. 3M, unless otherwise required by the UL System to be used.

2.4 ACCESS DOORS

A. Steel Access Doors and Frames: Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush with adjacent surfaces.

B. Frames: 16-gage steel, with a 1-inch-wide exposed perimeter flange for units installed in unit masonry, pre-cast, or cast-in-place concrete, ceramic tile, or wood paneling.

C. For installation in masonry, concrete, ceramic tile, or wood paneling: 1 inch-wide-exposed perimeter flange and adjustable metal masonry anchors.

D. For gypsum wallboard or plaster: Perforated flanges with wallboard bead.

E. For full-bed plaster applications: Galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.

F. Flush Panel Doors: 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint.

G. Fire-Rated Units: Insulated flush panel doors, with continuous piano hinge and self-closing mechanism.

H. Locking Devices: Flush, screwdriver-operated cam locks.

I. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Bar-Co., Inc.
   2. J.L. Industries.
   3. Karp Associates, Inc.
   4. Milcor Div. Inryco, Inc.
   5. Nystrom, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and application of sealants and access panels. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Install equipment and materials in accordance with manufacturer instructions and the requirements in Section 20 08 00 "Seismic Protection."

3.2 CONCRETE BASES

A. Provide concrete bases for all floor-mounted electrical equipment, except that stand alone dry type transformers with integral floor channels may be placed without equipment bases when located in finished areas and electrical closets.

B. Form concrete equipment bases using nominal 2 inch by 4 inch framing lumber (use larger framing if larger pads, such as for engine-generators are required) with form release compounds. Locate as indicated and construct 4 inches larger in both directions than supported unit. Except where otherwise indicated, pour bases 4-inches higher than surrounding slab. Anchor or key to floor slab in accordance with Section 200800 "Seismic Protection." Chamfer top edges and corners.

C. Install reinforcing bars, and place anchor bolts and sleeves using manufacturer's installation template.

D. Place concrete and allow to cure before installation of equipment.

3.3 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS "Structural Welding Code."

3.4 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.5 APPLICATION OF SEALERS

A. General: Comply with sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.
   1. Comply with recommendations of ASTM C 962 for use of elastomeric sealants.

B. Tooling: Immediately after sealant application and prior to time shinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

C. Apply rated firestopping sealants at all penetrations of fire and smoke walls; at all penetrations of floors and at other locations as noted on the drawings or where required by code. Consider walls that are common to different abutting buildings, to different additions to buildings, and to fire and smoke separations within buildings as requiring fire stopping sealant. Refer to architectural drawings. When in doubt, consult with Engineer or Architect.
   1. Submit the following approval before ordering materials for fire stopping:
      a. Fire stopping detail, including Underwriters Laboratories System Number, as listed in Volume 2 of the UL Fire Resistance Directory, for each different intended project application, such as cable tray penetration, conduit penetration, penetration of one-hour gypsum penetration, penetration of two hour concrete slab, etc.
      b. Fire stopping material manufacturer. This manufacturer must be listed in the applicable UL System Number detail.
      c. Submittals for approval by the engineer are not required for other items in this section. Unrequested submittals will not be processed or reviewed. Non-requirement of submittals is not to be construed as an allowance for

substitutions and does not relieve the contractor from full compliance with the plans and specifications.

3.6 INSTALLATION OF ACCESS DOORS

A. Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces.

B. Adjust hardware and panels after installation for proper operation.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes wires, cables, electrical tape and connectors for power, lighting, signal, control and related systems rated 600 volts and less.

1.3 SUBMITTALS

A. Submittals for approval by the Engineer are not required for this section. Unrequested submittals will not be processed or reviewed. Non-requirement of submittals is not to be construed as an allowance for substitutions and does not relieve the CM from full compliance with the plans and specifications.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with provisions of the following code:
   1. NFPA 70 "National Electrical Code:"
      a. Conform to applicable codes and regulations regarding toxicity of combustion products of insulating materials.
   2. UL Compliance: Provide components which are listed and labeled by Underwriters Laboratories under the following standards.
      a. UL Std. 83 Thermoplastic-Insulated Wires and Cables
      b. UL Std. 486A Wire Connectors and Soldering Lugs for Use with Copper Conductors
   3. NEMA and ICEA Compliance: Provide components which comply with the following standards:
      a. WC-5: Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
      b. WC-7: Cross Linked Thermosetting
      c. Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
   4. IEEE Compliance: Provide components which comply with the following standard.
      a. Std. 82: Test procedures for Impulse Voltage Tests on Insulated Conductors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Insulated tap connector:
   1. Blackburn Series IPC
   2. Buchanon B-Tap

B. Spring Wire Connectors for AWG sizes Number 14 to Number 10 in dry locations:
   1. 3M Scotchlok Y, R, G, and B
   2. Ideal Wingnut
   3. Thomas & Betts Type PT

C. Threaded on Wire Connectors for AWG sizes Number 8 and larger:
   1. Raychem TCS (indoor)
   2. Raychem WCSM (exterior)

D. Spring Wire Connectors for AWG sizes Number 14 to Number 10 in wet and damp locations:
   1. King Technology "One-Step" Model King-4, 5, 6, 9 Silicone-Filled Safety Connectors

E. Below Grade Wiring Connectors:
   1. 3M In-Line Cold Shrink Splice.
   2. King Technology "One-Step" Model King-4, 5, 6, 9 Silicone-Filled Safety Connectors.

F. For connections of cables to buswork: Use two hole mechanical lugs if space allows, otherwise use one-hole lugs. Lugs to be Burndy universal terminal series KA, K2A or K3A as required or approved equal.
   1. Electrical Tape: Use 3M Super #88 electrical tape. 3M #33, #33+ or other tapes are not acceptable.

2.2 WIRES AND CABLES

A. General: Provide wire and cable suitable for the temperature, conditions and location where installed.

B. Single Conductors for General Power and Lighting Circuits:
   1. Stranding: Provide solid conductors for lighting circuits and non-vibrating power utilization equipment utilizing Number 10 AWG and smaller and stranded conductors for Number 8 AWG and larger. Provide stranded conductors, regardless of size, for connections to vibrating equipment such as motors and transformers.
   2. Conductors of AWG Number 10 and smaller for lighting circuits and non-vibrating power utilization equipment may be stranded if used with devices, lugs and connectors specifically applicable for stranded conductors. Stranded conductors are not to be used with screw head binding, such as with side wired devices. Proper back-wired or pressure devices UL listed for stranded conductor termination must be used where stranded conductors are selected.
   3. Use stranded conductors for control circuits.

4. Conductor Material: Copper for all wires and cables.
5. Insulation: Provide XHHW or THHN or THWN insulation for all conductors. Provide XHHW or THWN for all conductors installed outdoors or underground
6. Color Coding for phase identification in accordance with Part 3 below.

C. Wiring for other systems such as fire alarm, paging, communications, etc., shall be as specified in those sections of these specifications.

PART 3 - EXECUTION

3.1 WIRING METHOD

A. Use the following wiring methods as indicated:
1. Wire: Install all wire in raceway, except in the following cases:
a. Low voltage conductors to systems such as communications and alarms in attic or crawl space cable tray.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 INSTALLATION OF WIRES AND CABLES

A. General: Install electrical cables, wires, and connectors in compliance with NEC.

B. Coordinate cable installation with other Work.

C. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant where necessary.

D. Use pulling means including, fish tape, cable, rope, and basket weave wire and cable grips which will not damage cables or raceways. Do not use rope hitches for pulling attachment to wire or cable. Do not exceed maximum tensile strength of conductor or grip. Do not exceed maximum sidewall pressure limitations of cables.

E. Conceal all cable in finished spaces.

F. Keep conductor splices to minimum.

G. Install splice and tap connectors which possess equivalent or better mechanical strength and insulation rating than conductors being spliced.

H. Use splice and tap connectors which are compatible with conductor material.

I. Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than Number 10 AWG cabled in individual circuits. Make terminations so there is no more than 1/8 inch of exposed bare conductor at the terminal.

J. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.

K. Verify that interior of building has been protected from weather.

L. Verify that mechanical work likely to damage wire and cable has been completed.

M. Install products in accordance with manufacturer's instructions.

N. Use conductor not smaller than Number 12 AWG for power and lighting circuits.

O. Single conductors used for control circuits shall not be smaller than Number 14 AWG.

P. Feeder conductors shall be continuous and shall not contain splices.

Q. Neatly train wiring inside boxes, equipment, and panelboards. Observe NEC 310- 15 (b)(2)(a) adjustment factors.

R. Clean conductor surfaces before installing lugs and connectors.

S. Make splices, taps, and terminations to carry full ampacity of conductors.
   1. Install splices and taps which possess equivalent-or-better mechanical strength and insulation ratings than conductors being spliced.
   2. Use splice and tap connectors which are compatible with conductor material.

T. Above grade:
   1. Use pre-molded insulated tap connectors for copper conductor splices and taps, Number 8 AWG and larger. Insulate with UL listed insulating cover supplied by same manufacturer as connector.
   2. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, Number 10 AWG and smaller.
   3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor, or three layers of tape, whichever is greater.

U. Below grade:
   1. Use specified insulated connectors suitable and approved for below grade wiring connectors. Ensure that conductors do not apply tension to splice.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Identify each conductor with its circuit Number or other designation indicated on Drawings.

3.5 FIELD QUALITY CONTROL

A. Inspect wire for physical damage and proper connection.

B. Measure tightness of bolted connections with properly scaled and calibrated torque tool and compare torque measurements with manufacturer's recommended values.

C. Before energizing, verify continuity and isolation of each branch circuit conductor.

D. Conductor Color Coding:
   1. Color code secondary service, feeder, and branch circuit conductors, as follows:

208Y/120 Volts	Phase	480Y/277 Volts
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray
Green	Ground	Green with yellow stripe

   2. Permanently post this identification table at all branch circuit panelboards.

E. Conductor Color Coding Methods: Use conductors with color factory-applied the entire length of the conductors except that the following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than Number 6 AWG.

F. For phase conductors:
   1. Apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 4 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1/2 or 3/4 inch-wide 3M Scotch #35 tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.
   2. In lieu of pressure-sensitive tape, colored non-conductive cable ties may be used for color identification. Apply three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.

G. For neutral conductor:
   1. Same as for phase conductors except that three continuous white strips, factory applied, may be used. Cable ties not allowed.
   2. Neutral wires serving AFCI protected circuits requiring a dedicated neutral shall be white in color and include a permanent stripe or tracer with a color matching phase used.

H. For ground conductor:
   1. Same as for phase conductors except that cable ties are not allowed.

I. Prior to energizing, test wires and cables for electrical continuity and for short circuits.

J. Subsequent to wire and cable hook-ups, energize circuits and demonstrate proper functioning. Correct malfunctioning units, and retest to demonstrate compliance.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes solid grounding of electrical systems and equipment. It includes basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other sections of these Specifications.

1.3 SUBMITTALS

A. Submittals for approval by the Engineer of products to be used are not required for this section. Unrequested submittals will not be processed or reviewed. Non-requirement of submittals is not to be construed as an allowance for substitutions and does not relieve the CM from full compliance with the plans and specifications.

B. Submit the following to the Engineer:
   1. Report of field tests and observations of the type indicated under Part 3 - Execution.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled for the specific purposes by Underwriter's Laboratories.

B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code" (NEC).

C. UL Standard: Comply with UL 467, "Grounding and Bonding Equipment."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Erico Products, Inc.
   2. Ideal Industries, Inc.
   3. O-Z/Gedney Co.

2.2 GROUNDING AND BONDING PRODUCTS

A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

B. Conductor Materials: Copper.

2.3 WIRE AND CABLE CONDUCTORS

A. General: Comply with Division 26 Section "Low-Voltage Electrical Power and Cables." Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.

B. Equipment Grounding Conductor: Copper, green insulated.

C. Grounding Electrode Conductor: Copper, stranded cable.

D. Bare Copper Conductors: Conform to the following:
   1. Solid Conductors: ASTM B-3.
   2. Assembly of Stranded Conductors: ASTM B-8.
   3. Tinned Conductors: ASTM B-33.

2.4 MISCELLANEOUS CONDUCTORS

A. Ground Bus: Bare annealed copper bars of rectangular cross section.

B. Braided Bonding Jumpers: Copper tape, consisting of braided No. 30 gage bare copper wire, terminated with copper ferrules.

C. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.

2.5 CONNECTOR PRODUCTS

A. General: Listed and labeled as grounding connectors for the materials used.
   1. Pressure Connectors: High-conductivity-plated units.
   2. Bolted Clamps: Heavy-duty units listed for the application.
   3. Exothermic Welded Connections: Provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.

2.6 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel with high-strength steel core and electrolytic-grade copper outer sheath, molten welded to core.
   1. Size: 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATION

A. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.

B. Install separate insulated equipment grounding conductors with circuit conductors for all feeders and branch circuits.

C. Nonmetallic Raceways: Install an insulated equipment ground conductor in nonmetallic raceways containing power conductors.

D. Air Duct Equipment Circuits: Install an insulated equipment-grounding conductor to duct-mounted electrical devices operating at 120-V and above including air cleaners and heaters. Bond the conductor to each such unit and to the air duct.

E. Water Heater, Heat Tracing, and Anti-Frost Heater Circuits: Install separate insulated equipment ground conductor to each electric water heater, heat tracing, and surface anti-frost heating cable. Bond this conductor to heater units, piping, and connected equipment and components.

F. Underground Conductors: Bare, stranded copper except as otherwise indicated.

G. Signal and Communications: For telephone, alarm, and communication systems, provide a green insulated copper conductor in raceway from the grounding electrode system to each terminal cabinet or central equipment location. Size of the conductor shall be minimum #4 copper or as shown on drawings, whichever is larger.

H. Separately derived systems required by NEC to be grounded shall be grounded in accordance with the NEC.

I. Bond electrical system grounding, telephone, CATV, other communications systems, water piping, gas piping, and other piping systems together.

3.2 INSTALLATION

A. Ground Rods: Locate a minimum of three ground rods at two-rod lengths from each other and at least the same distance from any other grounding electrode. Interconnect ground rods with bare conductors buried at least 24 inches below grade. Connect bare-cable ground conductors to ground rods by means of exothermic welds except as otherwise indicated. Make these connections without damaging the copper coating or exposing the steel. Drive rods until tops are 6 inches below finished floor or final grade except as otherwise indicated.

B. Metallic Water Service Pipe: Provide insulated copper ground conductors, sized as indicated, in conduit from the building main service equipment, or the ground bus, to main metallic water service entrances to the building. Connect ground conductors to the main metallic water service pipes by means of ground clamps. Where a dielectric main water fitting is installed, connect the ground conductor to the street side of the fitting. Install a

grounding jumper around dielectric fittings. When the grounding electrode conductor is routed in metal conduit, bond the conduit to the conductor at each end.

C. Braided-Type Bonding Jumpers: Install to connect ground clamps on water meter piping to bypass water meters electrically. Use elsewhere for flexible bonding and grounding connections.

D. Route grounding conductors along the shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage, except as indicated.

E. Bond interior metal piping systems and metal air ducts to equipment ground conductors of pumps, fans, electric heaters, and air cleaners serving individual systems.

3.3 CONNECTIONS

A. General: Make connections in such a manner as to minimize possibility of galvanic action or electrolysis.

B. Make connections with clean bare metal at points of contact.

C. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.

D. Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.

E. Coat and seal connections involving dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

F. Exothermic Welded Connections: Use for connections to structural steel and for underground connections except those at test wells. Install at connections to ground rods and plate electrodes. Comply with manufacturers written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

G. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus or lug in the housing. Bond conduits at both entrances and exits with grounding bushings and bare grounding conductors.

H. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.

I. Compression-Type Connections: Use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.

J. Cable tray and ladder rack shall be bonded at all joints in the cable tray/ladder rack, to communications conduits, sleeves and the telecommunications grounding bus bar with #6 AWG bonding jumper.

3.4 FIELD QUALITY CONTROL

A. Tests: The maximum acceptable impedance to ground at the service entrance is 5 ohms. Subject the completed grounding system to a resistance test at each location where a ground resistance test is specified, and at service disconnect enclosure ground terminal, and at ground test wells. Measure ground resistance without the soil being moistened by any means other than natural precipitation or natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Notify the Engineer of the scheduled testing time at least 48 hours in advance of the scheduled test time. Perform tests by the fall of potential method in accordance with Section 9.03 of IEEE 81, "Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Grounding System."

B. Report: Prepare test reports of the ground resistance at each test location. Buried ground systems shall be tested before pavement is installed in order to allow for possible changes to the grounding system. Include observations of weather and other phenomena that might affect test results. Submit results of testing to the Engineer.

C. Deficiencies: When directed by the Engineer, modify the grounding system to reduce resistance values. Where measures are directed that exceed those indicated in the provisions of the Contract, covering changes will apply.

3.5 CLEANING AND ADJUSTING

A. Restore surface features at areas disturbed by excavation and reestablish original grades except as otherwise indicated. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other Work to their original condition. Include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, or mulching. Maintain disturbed surfaces and restore. Restore disturbed paving as indicated.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fastenings.

B. Refer to other Division 26 sections for additional specific support requirements that may be applicable to specific items.

1.3 SUBMITTALS

A. Submittals for approval by the Engineer are not required for this section. Unrequested submittals will not be processed or reviewed. Non-requirement of submittals is not to be construed as an allowance for substitutions and does not relieve the CM from full compliance with the plans and specifications.

1.4 QUALITY ASSURANCE

A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."

B. Electrical components shall be listed and labeled for the specific intended purpose by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Slotted Metal Angle and U-Channel Systems:
      a. Allied Tube & Conduit
      b. American Electric
      c. B-Line Systems, Inc.
      d. Cinch Clamp Co., Inc.
      e. GS Metals Corp.
      f. Haydon Corp.
      g. Kin-Line, Inc.
      h. Unistrut Diversified Products

2. Conduit Sealing Bushings:
    a. Bridgeport Fittings, Inc.
    b. Killark Electric Mfg. Co.
    c. O-Z/Gedney
    d. Raco, Inc.
    e. Red Seal Electric Corp.
    f. Spring City Electrical Mfg. Co.
    g. Thomas & Betts Corp.

2.2 COATINGS

A. Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic.

2.3 MANUFACTURED SUPPORTING DEVICES

A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.

B. Fasteners: Types, materials, and construction features as follows:
    1. Expansion Anchors: Carbon steel wedge or sleeve type.
    2. Toggle Bolts: All steel springhead type.

C. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.

D. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.

E. U-Channel Systems: 16-gauge steel channels, with 9/16-inch-diameter holes, between one and one half and two and one half inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacture.

2.4 FABRICATED SUPPORTING DEVICES

A. General: Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.

B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.

C. Pipe Sleeves: Provide pipe sleeves of one of the following:
    1. Interior Dry Locations: Fabricate from Schedule 40 galvanized steel pipe or Schedule 40 PVC plastic pipe.

2. Exterior or Interior Wet or Damp Locations: Fabricate from Schedule 40 PVC plastic pipe.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.

B. Coordinate with the building structural system and with other electrical installation.

C. Raceway Supports: Comply with the NEC and the following requirements:

D. Conform to manufacturer's recommendations for selection and installation of supports.

E. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.

F. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.

G. Support parallel runs of horizontal raceways together on trapeze-type hangers.

H. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1 inch and smaller raceways serving branch circuits, telephone and data above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.

I. Space supports for raceways in accordance with Table I of this section. Space supports for raceway types not covered by the above in accordance with NEC.

J. Support exposed and concealed raceway within 3 feet of boxes, access fittings, device boxes, cabinets or other raceway terminations.

K. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.

L. Vertical Conductor Supports: Install simultaneously with installation of conductors.

M. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.

N. Sleeves: Install in concrete slabs and walls and all other fire-rated floors and walls for raceways and cable installations. Provide insulated bushings at each end of sleeve. For sleeves through fire rated-wall or floor construction, apply UL-listed firestopping sealant in gaps between sleeves and enclosed conduits and cables.

O. Conduit Seals: Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

P. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, motor control centers, disconnect switches, and control components in accordance with the following:
   1. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
   2. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
   3. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration- and shock-resistant fasteners for attachments to concrete slabs.

TABLE I: SPACING FOR RACEWAY SUPPORTS

			Maximum Spacing of Supports (Feet)		
Raceway Size (Inches)	No. of Conduits in Run	Location	RMC & IMC*	EMT	RNC
1) HORIZONTAL RUNS					
1/2, 3/4	1 or 2	Flat ceiling or wall.	5	5	3
1/2, 3/4	1 or 2	Where it is difficult to provide supports except at intervals fixed by the building construction.	7	7	--
1/2, ¾, 1	3 or more	Any location.	7	7	--
1 & larger	1 or 2	Flat ceiling or wall.	6	6	--
1 & larger	1 or 2	Where it is difficult to provide supports except at intervals fixed by the building construction.	10	10	--
1 & larger	3 or more	Any location.	10	10	--
Any	--	Concealed.	10	10	--
2) VERTICAL RUNS					
1/2, 3/4	--	Exposed.	7	7	--
1, 1-1/4	--	Exposed.	8	8	--
1-1/2 and larger	--	Exposed.	10	10	--
Up to 2	--	Shaftway.	14	10	--
2-1/2	--	Shaftway.	16	10	--
3 & larger	--	Shaftway.	20	10	--
Any	--	Concealed.	10	10	--

*Maximum spacings for IMC above apply to straight runs only. Otherwise the maximums for EMT apply.

Abbreviations:
- EMT Electrical metallic tubing
- IMC Intermediate metallic conduit
- RMC Rigid metallic conduit
- RNC Rigid nonmetallic conduit

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SEISMIC REQUIREMENTS

A. Conform to requirements in Section 200800 "Seismic Protection."

1.3 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Raceways include the following:
1. Rigid metal conduit
2. Intermediate metal conduit
3. Rigid non-metallic conduit and duct
4. Electrical metallic tubing (EMT)
5. Flexible metal conduit
6. Liquidtight flexible conduit
7. Wireway
8. Surface raceways
9. Boxes, enclosures, and cabinets include the following:
    a. Device boxes
    b. Floor boxes
    c. Outlet boxes
    d. Pull and junction boxes
    e. Cabinets and hinged cover enclosures
    f. Conduit bodies

1.4 SUBMITTALS

A. Submittals for approval by the Engineer are not required for this section. Unrequested submittals will not be processed or reviewed. Non-requirement of submittals is not to be construed as an allowance for substitutions and does not relieve the contractor from full compliance with the plans and specifications.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electrical Code" for components and installation.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled by Underwriter's Laboratories for the specific purpose and comply with the following standards:
   1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
   2. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
   3. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
   4. ANSI/NFPA 70 - National Electrical Code.
   5. NECA 1 "Standard practice of Good Workmanship in Electrical Construction (ANSI)."
   6. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
   7. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
   8. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
   9. NEMA TC 6 - PVC and ABS Plastic Utilities Duct for Underground Installation.

C. Comply with NECA "Standard of Installation."

D. Coordinate layout and installation of raceway and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.1 CONDUIT REQUIREMENTS

A. General: Provide conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) for each service indicated. Where types and grades are not indicated, provide proper selection determined by Installer to fulfill wiring requirements, and comply with applicable portions of NEC for raceways.

B. Minimum Size: 3/4 inch, switch legs may be ½ inch minimum, and fixture heat whips may be 1/2 inch minimum.

2.2 METAL CONDUIT

A. Rigid Steel Conduit: Conduit to be seamless, hot dipped galvanized rigid steel. Threads to be cut and ends chamfered prior to galvanizing. Galvanizing to provide zinc coating fused to inside and outside walls of conduit. Provide an enamel lubricating coating on the inside of the conduit. Conduit to conform to ANSI C80.1 and listed and labeled under UL 6.

B. Rigid Aluminum Conduit: Conduit to be seamless, 6063 alloy, T-1 temper. Conduit to conform to ANSI C80.5 and listed and labeled under UL6.

C. Intermediate Metal Conduit: Conduit to be seamless, hot dipped galvanized rigid steel. Threads to be cut and ends chamfered prior to galvanizing. Galvanizing to provide zinc coating fused to outside walls of conduit. Provide an enamel lubricating coating on the inside of the conduit. Conduit to be listed and labeled under UL 1242.

D. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit. Couplings for rigid steel conduit and IMC to be single piece threaded, cadmium plated malleable iron. Conduit bodies may be aluminum. Couplings for rigid aluminum conduit to be of aluminum construction, 6063 alloy. Hubs for box connection to be two-piece with outer internally threaded hub to receive conduit and inner locking ring with bonding screw. Expansion fittings shall allow for a minimum of four inches of movement and shall be similar to O-Z Gedney AX series, complete with bonding jumpers and hardware.

E. Raintight Sealing Hubs: Two piece type with outer internally-threaded hub to receive conduit, inner locking ring with bonding screw, insulated throat, and V-shaped ring or O-ring .
   1. Manufacturers: Thomas & Betts H series or Bridgeport.

2.3 FLEXIBLE METAL CONDUIT AND FITTINGS

A. Description: Interlocked steel or aluminum construction.

B. Flexible Metal Steel Conduit: Conduit to be constructed of spirally wrapped, convoluted hot dip galvanized steel strip. Zinc coating to cover both sides and all edges of steel strip. Convolutions to be interlocked to prevent separation when conduit is bent at radius equal to 4-1/2 times conduit O.D. Conduit to be listed and labeled under UL 1 - 1985.

C. Flexible Metal Aluminum Conduit: Conduit to be constructed of spirally wrapped, convoluted aluminum strip. Convolutions to be interlocked to prevent separation when conduit is bent at radius equal to 4-1/2 times conduit O.D. Conduit to be listed and labeled under UL 1 - 1985.
   1. Fittings: ANSI/NEMA FB 1 -1988.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT and FITTINGS

A. Liquidtight flexible metal conduit and fittings shall meet the same construction specifications as flexible metal conduit above and shall have an outer PVC jacket.

B. Liquidtight Flexible Metal Steel Conduit: Conduit to be listed and labeled under UL 360 - 1986.

C. Liquidtight Flexible Metal Aluminum Conduit: Conduit to be listed and labeled.

D. Liquidtight flexible conduit connectors to consist of body, cone (ferrule), sealing gland, and nut. Fitting to be UL 514B - 1987 listed for grounding. Body to be cadmium plated malleable iron and have male and female thread for attachment to box or conduit as required.

2.5 ELECTRICAL METALLIC TUBING (EMT) and FITTINGS

A. Description: Conduit to be seamless, hot dipped or electro-galvanized steel tubing. Galvanizing to provide zinc coating fused to outside walls of conduit. Provide an enamel lubricating coating on the inside of the conduit. Conduit to conform to ANSI C80.3 - 1983 and listed and labeled under UL 797 - 1983.

B. Provide steel set-screw type connectors and couplings for interior EMT fittings. Connectors and fittings to be cadmium plated, zinc plated steel, or malleable iron fittings and include insulated throats. Die cast fittings, components, and indenter type couplings and connectors are not allowed.

C. Expansion fittings for use with EMT shall allow for a minimum of four inches of movement and shall be similar to O-Z Gedney TX series, complete with bonding jumpers and hardware.

2.6 CONDUIT BUSHINGS

A. Bushings for terminating conduits smaller than 1-1/4 inches are to have flared bottom and ribbed sides, with smooth upper edges to prevent injury to cable insulation. Install insulated type bushings for terminating conduits 1-1/4 inches and larger. Bushings are to have flared bottom and ribbed sides. Upper edge to have phenolic insulating ring molded into bushing. Bushings to have screw type grounding terminal.

2.7 RIGID NONMETALLIC CONDUIT AND DUCT

A. Description:
1. Rigid Non-Metallic Conduit: Conduit to be PVC, Schedule 40 or Schedule 80 as indicated, conforming to ANSI, NEMA specifications and be listed and labeled under UL 651. May be used in or under concrete slabs on grade and in exterior when concrete encased {3 in. minimum cover),

B. Fittings and Conduit Bodies:
1. Rigid non-metallic conduit connectors and couplings to be manufactured per NEMA TC-3 and UL 651 listed.

2.8 NONMETALLIC CONDUIT FITTINGS

A. PVC Conduit and Tubing Fittings: NEMA TC 3; match to conduit, tubing type and material. Expansion fittings shall allow for six inch movement, and shall be similar to Carlon E945 series.

2.9 ELECTRICAL NONMETALLIC TUBING (ENT) and FITTINGS

A. Description: Tubing to be pliable corrugated PVC raceway of circular cross section, suitable for use in accordance with NEC Article 331. ENT to comply with NEMA TC 13 and listed under UL 1653.

B. Connectors and couplings shall be either snap-on type manufactured specifically for ENT or solvent-welded rigid nonmetallic PVC fittings. All connectors shall be concrete-tight without use of an external covering.

2.10 WIREWAYS

A. Material: Galvanized sheet steel sized as indicated or required, whichever is greater.
1. Wireway up to 6 inch by 6 inch cross section shall be minimum 16 gauge.
2. Wireway larger than 6 inch by 6 inch cross section shall be minimum 14 gauge.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion fittings, seismic connections, adapters, hold-down straps, end caps, and other fittings to match and mate with wireway as required for complete system.

C. Select features where not otherwise indicated, as required to complete wiring system and to comply with NEC.

D. Wireway Covers: Hinged type.

E. Finish: Manufacturer's standard enamel finish.

2.11 SURFACE RACEWAY

A. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceway.

B. Surface Metal Raceway: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating suitable for painting.

C. Reference standard: Wiremold 2400 series

2.12 OUTLET AND DEVICE BOXES

A. Outlet Boxes shall be constructed in accordance with National Electrical Code Article 370. Outlet boxes shall be sized for the volume required by the National Electrical Code, but in no case shall they be less than 1-1/2 inches deep.
   1. Indoor: Galvanized steel, knockouts as required.
   2. Exterior boxes or exposed interior wet or damp locations: Cast, deep type, corrosion proof fasteners, watertight, gasketed, threaded hubs.
   3. For suspended or surface-mounted fixtures:
      a. Outlet boxes shall be 4 inch octagonal or 4 inch square, in accordance with devices used. Furnish outlet boxes with fixture studs where required. Provide 4 inch octagonal and square outlet boxes for all exposed conduit work with fixture extension pan or deep fixture canopy to enclose the outlet box.
   4. For recessed fixtures:
      a. 4 inch octagonal or square. Minimum 1-1/2 inches deep and complete with blank cover.
   5. Provide corrosion-resistant steel knockout closures for unused openings.

B. Sheet Metal Boxes: NEMA OS 1. Boxes for receptacle, telephone and data outlets shall be 4-11/16 inches square by 2-1/8 inches deep and shall be provided with extension rings.

C. Sheet metal boxes for lighting fixtures shall be 4 inch octagonal or square according to fixture hardware requirements.. Boxes shall be at least 1-1/2 inches deep.

D. Cast Metal Boxes: NEMA FB 1, type FD, cast feralloy box with gasketed cover.

2.13 FLOOR BOXES

A. Floor Box: Cast metal, fully adjustable, rectangular.

2.14 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1. Flush-mounted boxes shall have an overlapping cover.

B. Cast Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

C. Surface-mounted boxes: Screw-on or hinged cover.

D. Covers shall be the same material as the box. Cover shall be on the largest access side of the box, unless otherwise indicated.

E. Boxes located outdoors above ground shall be raintight and gasketed cast aluminum.

F. Boxes located in the ground or in wet or damp locations shall be cast malleable iron having cadmium finish, unless otherwise indicated.

2.15 CABINETS AND ENCLOSURES

A. Hinged Cover Enclosures: Per NEMA 250, steel enclosure with continuous hinge cover and flush latch. Finish inside and out with manufacturer's standard enamel.

B. Cabinets: Type 1, per NEMA 250, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

2.16 CONDUIT BODIES

A. Cast metal of type, shape and size to fit location and conduit.

B. Constructed with threaded conduit ends, removable cover, corrosion-resistant screws.

2.17 UNDERGROUND WALL PENETRATION SEALS

A. New Walls: Seal assembly shall consist of a matched sleeve and seal assembly. Sleeve shall be model WS steel sleeve and seal shall consist of interconnected rubber links, which shall create a water-tight and gas-tight seal. Sleeves and seals shall be PSI-Thunderline “Link-Seal” model C.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of

the raceway system. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Install equipment and materials in accordance with requirements in Section 200800 "Seismic Protection."

3.2 WIRING METHODS FOR 600 VOLTS AND LESS

A. Outdoor and Interior Wet and Damp Locations:
1. Underground Installations or under slab on grade: Use Schedule 40 PVC conduit a minimum of 3" below slab. Use rigid steel conduit for stub ups from slab and from below grade
2. Above Grade and Interior Wet and Damp Locations: Use rigid steel conduit. Provide spacers to maintain a minimum of 1/4 inch gap between the conduit and masonry and other surfaces detrimental to aluminum conduit.
3. Connections to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Flexible Liquidtight flexible metal conduit.
4. Boxes and Enclosures: NEMA Type 3R or Type 4, unless noted otherwise on the drawings.

B. Dry Interior Locations:
1. Concealed in Walls and Ceilings: Use electrical metallic tubing unless noted otherwise on drawings.
2. Exposed: Unless otherwise indicated on the drawings, the following shall apply:
   a. Use rigid metal or intermediate metal conduit within 6 feet 0 inches of the floor in areas subject to physical damage such as mechanical areas, loading dock areas, generator rooms and storerooms. Electrical metallic tubing may be used above 6 feet 0 inches from the floor and where not subject to physical damage. Rooms dedicated solely to electrical equipment do not require rigid metal or intermediate metal conduit, unless required elsewhere in the documents or by code, such as for medium voltage circuits.
3. Connections to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Liquid-tight flexible metal conduit. Use Liquidtight flexible metal conduit where subject to oil drips or spray and all other areas which are not completely free of spray, vapor and liquids.
   a. Boxes and Enclosures: NEMA Type 1, unless noted otherwise on the drawings.
4. Concealed in Interstitial space (crawl space): Use nonmetallic conduit unless noted otherwise on drawings.

3.3 INSTALLATION

A. Do not reduce the indicated sizes of raceways.

B. Do not install any raceway in concrete slabs. Under slab conduits to be a minimum of 3" below slab.

C. Raceway routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system. Verify field measurements and routing and termination locations of raceway prior to rough-in. Raceways are not to cross pipe shafts, or ventilating duct openings, nor are they to pass through HVAC ducts. Support riser raceway at each floor level with clamp hangers. Maintain adequate clearance between raceway and piping.

D. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

E. Avoid moisture traps; provide junction box with drain fitting at low points in raceway system.

F. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender when field fabricated elbows are required for bends in metal conduit larger than 2 inch size.

G. Expansion:
   1. Provide suitable fittings to accommodate expansion and contraction where raceway crosses seismic and expansion joints. Install expansion fittings in the full open position if installed during a period of lowest expected temperature, and in the fully closed position if installed during a period of highest expected temperature. Install at proportionate intermediate position for intermediate temperatures.

H. In addition to the foregoing, provide expansion fittings according to the following table, for exposed linear runs or runs in hung ceiling cavities where such runs do not contain junction boxes, pull boxes, nor bends totaling more than 30 degrees:

Raceway Material	Indoor, conditioned areas	Outdoors and non-conditioned areas
Steel	One expansion fitting in runs longer than 80 feet, additional expansion fittings every 400 feet	One expansion fitting in runs longer than 40 feet, additional expansion fittings every 200 feet

I. Seismic:
   1. Whenever Specification Section “Seismic Protection” is included in these specifications, the following is also required for those life safety, emergency, fire alarms, etc., conduits that are defined therein. Details on the drawings, when shown, are intended to clarify or supplement these requirements:
      a. All expansion joints shall be considered seismic joints that can cause movement in any direction during a seismic event. Conventional expansion fittings are not adequate for this condition.
      b. For exposed conduit runs or runs above hung ceilings, provide a length of flexible metal conduit across the joint that will allow 2 inches of conduit movement in any direction. Length of the flexible section shall not exceed 6 feet.
      c. For conduit runs in the slab except slab on grade: On each side of the joint, turn the conduit down into a junction box on the underside of the slab

or in the hung ceiling below. Provide a piece of exposed flexible metal conduit connecting the boxes. Length of the flexible conduit shall not exceed 6 feet.

d. For slabs on grade: Do not install any conduit through the joint in this slab. Routing underground beneath the joint is permitted only for conduit routed from a point in the building to appoint beyond the perimeter of the building.

J. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.

K. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.

L. Install raceways level and square and at proper elevations. Provide adequate headroom. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

M. Complete raceway installation before starting conductor installation.

N. Use temporary closures to prevent foreign matter from entering raceway.

O. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

P. Make bends and offsets so the inside diameter is not reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.

Q. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions, except as otherwise indicated.

R. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.

S. Run parallel or banked raceways together, on common supports where practical and make bends from same center line to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways.

T. Raceways passing through exterior below-grade slabs:

1. New walls: Install sleeve unit before wall is poured and install rubber link sealing unit between wall sleeve and raceway after concrete has cured and raceway is run. Ensure that bolt heads remain accessible on inside of building wall.

U. Terminate rigid and IMC conduits in threaded hubs. Screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Use raintight sealing hubs with neoprene O-ring between exterior of enclosure and exterior half of hub where exposed to weather or other wet locations.

V. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-lb tensile strength. Leave not less than 12 inches of slack at each end of the pull wire. Test conduits required to be installed, but left empty, with ball mandrel. Clear any conduit which rejects ball mandrel.

W. Telephone, data, and cable TV System Raceways 2-Inch Trade Size and Smaller: In addition to the above requirements, install in maximum lengths of 150 feet and with a maximum of three 90 degree bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements. Raceways for telephone, data, and cable TV systems may be employed using NEC ENT tubing.

X. Do not use ENT tubing for any other work and systems except where allowed in the above paragraph.

Y. Install raceway sealing fittings according to the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings where conduits enter or leave hazardous locations, where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces, and other places indicated on the drawings or required by the NEC.

Z. Stub-Up Connections: Use type of conduit described for stub ups from slab. Extend conduit through concrete floor for connection to freestanding equipment to a distance 6 inches above the floor and transition to Liquidtight flexible conduit. Provide grounding bushing at equipment end of Liquidtight flexible conduit. Connect equipment grounding conductor run with the serving branch circuit to this grounding bushing, the box, and the equipment ground connection point for the piece of equipment served.

AA. Install conduit and provide sealant to preserve smoke partition using materials and methods under the provisions of Section 07 92 00 “Joint Sealants.”
   1. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket.

BB. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use Liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

CC. Surface Metal Raceway: Install a separate green ground conductor in raceway from the junction box supplying the raceway to receptacle or fixture ground terminals. Install surface metal raceway with all necessary offsets, fittings, bends and boxes to comprise a complete system.
   1. Select each surface metal raceway outlet box to which a lighting fixture is attached to be of sufficient diameter to provide a seat for the fixture canopy.
   2. Where a surface metal raceway is used to supply a fluorescent lighting fixture having central stem suspension with a backplate and a canopy (with or without

extension ring), the backplate and canopy will serve as the outlet box and no separate outlet box need be provided.

3. Provide surface metal raceway outlet box, in addition to the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end stem suspension.
4. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed (provide a backplate slightly smaller than the fixture canopy), no additional surface mounted outlet box need be installed.

DD. Set floor boxes level and adjust to floor surface.

EE. Install hinged cover enclosures and cabinets plumb. Support at each corner.

FF. Provide grounding connections for raceway, boxes, and components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

GG. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.

3.4 BOXES AND CABINETS

A. Provide boxes as shown and for splices, taps, wire pulling, equipment and fixture connections and where required by applicable codes and installation practices.

B. Electrical boxes are shown on drawings in approximate locations unless dimensioned. The Engineer or Architect shall be allowed to adjust the location of boxes up to 10 feet in any direction without additional cost to the project. This is intended for boxes for receptacles and switches and other wiring devices.

C. Locate boxes to maintain headroom and present a neat appearance. Locate to allow proper access. Provide access doors for boxes located above inaccessible ceilings.

D. Provide knockout closures to cap unused knockout holes where blanks have been removed.

E. Support all boxes rigidly and independently of conduit except where specifically allowed by the National Electrical Code. Use supports suitable for the purpose.

F. Set floor boxes level and adjust to floor surface.

G. Outlet Boxes:
1. Flush-mount outlet boxes in finished areas. Outlets in mechanical rooms, electrical rooms, and the above removable ceilings may be surface-mounted.
2. Do not install boxes back-to-back in same wall. Provide at least 16 inch separation or greater where required by the building code. In hollow fire walls,

maintain minimum 24 inch horizontal separation between outlets on opposite sides. Refer to detail 3, sheet E-8.01.

a. Masonry walls:
   1) Adjust position of outlets in finished masonry walls to suit masonry course lines where possible. Do not, however, violate maximum heights defined by accessibility codes such as ADA.
      a) Coordinate cutting in of walls to achieve neat openings for boxes. Locate boxes in walls so that only the corner need be cut from masonry units where possible.
   2) Use multiple gang boxes where more than one device is mounted together. Provide barriers to separate different voltage systems.
   3) Ensure that thermal insulation will be in place behind outlet boxes before installing them in insulated walls. Do not damage insulation.
   4) For outlets mounted above counters, benches, or backsplashes, coordinate location and mounting heights with architectural details. Install with bottom of box minimum 2 inches above backsplash.
   5) Adjust outlet mounting height and horizontal location to agree with required location for equipment served as may be shown on installation instructions or shop drawing for the equipment.
   6) Position outlets to locate luminaries as shown on reflected ceiling drawings. For recessed boxes in finished areas, secure to interior wall and partition studs; allow for surface finish thickness.
   7) Align wall-mounted outlet boxes for switches, thermostats, and similar devices.
b. Pull and Junction Boxes:
   1) Locate above accessible ceilings or in unfinished areas.
   2) Support independent of conduit.
   3) Locate pull or junction boxes to limit conduit runs to no more than 150 linear feet of four (4) 90 degree bends between pulling points. For telephone/ data limit bends to no more than three (3) 90 degree bends to pulling points.

H. Provide covers for all boxes.

I. Special care shall be taken to set all flush boxes square and true with the building finish. The edge of the cover shall meet the building finish or be no greater than 1/8 inch back from the finish surface. All wall outlets shall be rigidly secured to the stud system, using adjustable supports where necessary, to prevent all box movement.

3.5 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to Engineer or Architect to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.

B. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

C. Repair damage to PVC or paint finishes with matching touch-up coating recommended by the manufacturer.

3.6 CLEANING

A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

3.7 MARKING AND IDENTIFICATION

A. Mark and identify conduits in accordance with Section 26 05 53 “Identification for Electrical Systems.”

3.8 RECORD DOCUMENTS

A. Accurately record actual routing of all feeder and sub-feeder conduits regardless of size and branch circuits conduits larger than 2 inches.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including but not limited to the following:
   1. Buried electrical line warnings
   2. Identification labeling for raceways, cables, and conductors
   3. Operational instruction signs
   4. Warning and caution signs
   5. Equipment labels and signs

B. Refer to other Division 26 sections for additional specific electrical identification associated with specific items.

1.03 SUBMITTALS

A. Do not submit product data or shop drawings. Non-requirement of submittals is not to be construed as an allowance for substitutions and does not relieve the CM from full compliance with the plans and specifications.

1.04 QUALITY ASSURANCE

A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Electromark - Wolcott, New York
   2. Ideal Industries, Inc.
   3. 3M
   4. Panduit Corp.
   5. Seton Name Plate Co.
   6. Thomas & Betts
   7. W. H. Brady, Co. - Signmark Division - Milwaukee, Wisconsin

2.02 ELECTRICAL IDENTIFICATION PRODUCTS

A. Indoor Pictogram Signs for Equipment and Doors to Electrical Equipment Rooms: Self adhesive, polyester, minimum 7 by 17 inch size.

B. Underground Line Marking Tape: Permanent, bright-colored, continuous-printed, plastic, tape compounded for direct-burial service not less than 6 inches wide by 4 mils thick. Printed legend shall be indicative of general type of underground line below, such as "CAUTION - BURIED ELECTRIC LINE BELOW," "CAUTION - BURIED TELEPHONE LINE BELOW," etc. Tape shall have integral metallic facing or metallic core to allow locating buried tape with electronic detection equipment. Provide marking tape similar to Thomas & Betts NAF series.

C. Wire and Cable Designation Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound, cable and conductor markers with preprinted numbers and letter.

D. Plasticized Card Stock Tags: Vinyl cloth with preprinted and field-printed legends to suit the application. Orange background, except as otherwise indicated, with eyelet for fastener.

E. Engraved, Plastic-Laminated Labels, Signs, and Instruction Plates: Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8-inch thick for larger sizes. Engraved legend in black letters on white face and punched for mechanical fasteners.

F. Fasteners for Plastic-Laminated and Metal Signs: Self-tapping stainless steel screws or number 10-32 stainless steel machine screws with nuts and flat and lock washers.

G. Cable Ties: Fungus-inert, self-extinguishing, nylon one-piece, self-locking cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a minimum temperature range from minus 50 deg F to 350 deg F. Provide ties in specified colors when used for color-coding.

H. Identification Cable Ties: Same as "Cable Ties" above, except with integral tab of suitable size for marking requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as required by code.

B. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.

C. Apply identification to areas as follows:
   1. Clean surface of dust, loose material, and oily films before painting.
   2. Prime surfaces: For galvanized metal, use single- component acrylic vehicle coating formulated for galvanized surfaces. For concrete masonry units, use heavy-duty

acrylic resin block filler. For concrete surfaces, use clear alkali-resistant alkyd binder-type sealer.

3. Apply one intermediate and one finish coat of orange silicone alkyd enamel.
4. Apply primer and finish materials in accordance with manufacturer's instructions.

D. Identify Raceways of Certain Systems with Color Banding: Band exposed or accessible raceways of the following systems for identification. Bands shall be pretensioned, snap-around colored plastic sleeves, colored adhesive marking tape, or a combination of the two. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side. Install bands at changes in direction, at penetrations of walls and floors, and at 40-foot maximum intervals in straight runs. Apply the following colors:
   1. Fire Alarm System: Red
   2. Telecommunications: Blue

E. Identify Junction, Pull, and Connection Boxes: Code-required caution sign for boxes shall be pressure-sensitive, self-adhesive label indicating system voltage in black, preprinted on orange background. Install on outside of box cover. Legibly mark box covers with identity of contained circuits with contrasting color permanent marker.

F. Underground Electrical Line Identification: During trench backfilling, for exterior underground power, signal, and communications lines, install continuous underground line marking tape located directly above each respective line at 6 to 8 inches below finished grade.

G. Conductor Color Coding for Conductors Rated 600 Volts and Less: See Specification Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

H. Tag or label conductors as follows:
   1. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.

I. Apply warning, caution, and instruction signs and stencils as follows:
   1. Install warning, caution, or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic-laminated instruction signs with Owner approved legend where instructions or explanations are needed for system or equipment operation. Install fiberglass signs or outdoor items.

J. Install identification as follows:
   1. Apply equipment identification nameplates of engraved plastic-laminate on each major unit of electrical equipment, including central or master unit of each electrical system. This includes communication, signal and alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/2-inch-high lettering on 1-1/2-inch-high label (2-inch-high where two lines are required), black lettering in white field. Text shall match terminology and numbering of the Contract Documents and shop drawings. All nameplates shall be mounted with rivets or screws. Apply labels for each unit of the following categories of electrical equipment.
      a. Fire alarm master station or control panel
      b. Transformers

c. Electrical switchgear and switchboards
d. Motor starters, VFDs
e. Pushbutton stations
f. Contactors
g. Panelboards, electrical cabinets, and enclosures
h. Access doors and panels for concealed electrical items

K. Apply labels of engraved plastic laminate for disconnect switches, circuit breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm and signal components, where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items served by each individual switch and circuit breaker.

L. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

M. Nameplate Data: Provide permanent operational data nameplate on each item of power operated equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

N. Service Disconnects: Provide permanent engraved sign with 2 inch high black lettering on white background clearly describing the location of all other service disconnecting means (retail services for buildings 1A and 1B) when the building is served by more than one source of electrical power. Locate signs at each power source's disconnect means.

O. Outdoor Electrical Equipment: Provide outdoor Pictogram type sign per above specifications, with the words "DANGER - HIGH VOLTAGE Hazardous Voltage. Will shock burn, or cause death. KEEP OUT." NEMA Mr. Ouch symbol shall be included. Install at all entrances to outdoor areas and every 20 feet along area fences, with at least one sign per side of fencing. Install on doors to equipment.

P. Fusible Switches: Install fuse manufacturer supplied labels inside the door of the fusible switch indicating the proper type and fuse required for replacement.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes various types of receptacles, connectors, switches, and finish plates.

1.03 SUBMITTALS

A. Submittals for approval by the Engineer are not required for this section. Unrequested submittals will not be processed or reviewed. Non-requirement of submittals is not to be construed as an allowance for substitutions and does not relieve the CM from full compliance with the plans and specifications.
   1. Sample: Submit sample of receptacle plate or switch plate.

1.04 QUALITY ASSURANCE

A. Comply with NFPA 70 - "National Electrical Code" for devices and installation.

B. Comply with UL 498 - “Attachment Plugs and Receptacles.”

C. Comply with UL 943 - “Ground-Fault Circuit-Interrupters.”

D. Listing and Labeling: Provide products which are listed and labeled by Underwriter's Laboratories for their applications and installation conditions and for the environments in which installed.

1.05 COORDINATION

A. Wiring Devices for Owner-Furnished Equipment: Match devices to plug connectors for Owner-furnished equipment.

B. Cord and Plug Sets: Match cord and plug sets to equipment requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wiring Devices:
    a. Leviton
    b. Hubbell Inc.
    c. Pass & Seymour/Legrand
2. Not Used:
3. Vacancy Sensors:
    a. Watt-Stopper
    b. Sensor Switch
    c. Leviton
    d. Lutron
    e. Hubbell
4. Poke-Through, Floor Service Outlets, and Telephone/Power Poles:
    a. Hubbell, Inc.
    b. Wiremold Co.
    c. Thomas & Betts
5. Device Enclosures for Outdoor and Other Wet and Damp Locations:
    a. Pass & Seymour
    b. Leviton, Inc.
    c. Hubbell

2.2 WIRING DEVICES

A. Comply with NEMA Standard WD 1, "General Purpose Wiring Devices" and NEMA Standard WD6 “Wiring Device Dimensional Requirements.”

B. Enclosures: NEMA 1 equivalent, except as otherwise indicated.

C. Color:
1. Normal Power - Ivory except as otherwise indicated or required.
2. Standby Power - Gray except as otherwise indicated or required.
3. Life Safety Power - Red except as otherwise indicated or required.

D. Receptacles, Straight-Blade and Locking Type: Except as otherwise indicated, comply with UL Standard 498, "Electrical Attachment Plugs and Receptacles." Provide UL labeling of devices to verify these compliances. Provide straight blade receptacles per table on the following page.

E. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, UL 498, UL 1449, IEEE 587 and Federal Spec W-C 596.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
    a. Cooper.
    b. Hubbell.
    c. Leviton.
    d. Pass & Seymour; (reference standard: TR5362).

STRAIGHT BLADE DUPLEX RECEPTACLES						
APPLICATION	SPECIFICATION	ARROW HART	BRYANT	HUBBELL	LEVITON	PASS & SEYMOUR
Specification Grade	UL 498, Fed Spec. WC 596	*	*	HBL5362	*	*
Heavy Duty GFI	UL 943, UL 498, Fed. Spec. WC 596G	*	*	GF20	*	*

Duplex, straight blade devices, 120 volt, 20 amperes. All shall comply with Federal Specification W-C-596, NEMA configuration 5-20R.
*See reference standard.

F. Locking or special type to be of NEMA configuration called out for the specific application on the drawings.
   1. Type “A” to be a NEMA type 6-20R
   2. Type “B” to be a NEMA type L6-30R
   3. Type “C” to be a NEMA type 6-15R
   4. Type “D” to be a 60 amp pin and sleeve connector/receptacle (Mass Spectrometer)
   5. Type “E” to be a European type (Relocated from Culler Hall by the CM)
   6. Type “F” to be a NEMA type 5-30R
   7. Type “R” to be disconnected and relocated from Culler Hall

G. Cord and Plug Sets: Match voltage and current ratings and number of conductors to requirements of the equipment being connected.
   1. Cord: Rubber-insulated, stranded copper conductors, with type SOW-A jacket. Grounding conductor shall have green insulation. Minimum ampacity of cord shall be equipment rating plus 25 percent minimum.
   2. Plug: Male configuration with nylon body and integral cable-clamping jaws. Match to cord and to receptacle type intended for connection.

H. Snap Switches: Quiet-type A.C. switches, Underwriter's Laboratories listed and labeled as complying with UL Standard 20 "General Use Snap Switches, 20A, 277v.

I. Cover Plates for Interior Wiring Devices: Single and combination types that mate and match with corresponding wiring devices. Features include the following:
   1. Color/material: Stainless steel with brushed nickel satin finish

J. Device Enclosures for Outdoor and Other Wet and Damp Locations: Enclosure shall be suitable for wet locations while in use in accordance with Article 410-57 (b) and listed and labeled for the specific use by Underwriter's Laboratories. Enclosure shall be clearly and visibly marked by the factory with the wording "Suitable For Wet Locations While In Use." Enclosure shall be non-metallic with hinged clear cover and integral key operated cover lock. Cover to have two exit holes for up to 3/8 inch diameter cords with holes located at bottom of cover. Provide cover with device opening matched to type of wiring device used - e.g., duplex receptacle, GFCI receptacle, and toggle switch.

K. At CM's option, receptacles having plug tail connectors consisting of a female at the receptacle and a matching male on the pigtail are acceptable provided that the ratings listings and other portions of this specification apply. The receptacle shall have no exposed parts or wiring when the mating connector is installed.

2.3 VACANCY SENSORS

A. General:
1. All vacancy sensors shall be UL listed and shall meet the energy code requirements of the area in which they are to be installed. All vacancy sensors shall be manufactured by the same single manufacturer.
2. Install all vacancy sensors in accord with manufacturer's recommendations.
3. The CM and manufacturer shall select units with the required contact voltage and current ratings as required for the lighting load the sensor is to control, taking into account the nature of the load, i.e., incandescent, inductive, etc.
4. In addition, select sensors to cover the physical area in which they are to be installed. This might mean using large area units or multiple units in a given space. When necessary, provide interconnecting wiring between units, relays and manufacturer's control units where required. These accessories are not shown or specified but shall be provided where the physical conditions of the room or the electrical requirements of the load so necessitate.
5. Make all adjustments for each vacancy sensor for light level, sensitivity and time delay in coordination with and to suit the needs and requirements of the Owner. Tilt and adjust adjustable units for maximum coverage.
6. For all units but especially for non-standard room shapes, such as in the case of long narrow rooms or hallways, select units with the appropriate field of view, standard or long range lenses, wide angle lenses, linear coverage, etc., all as required to suit the application.
7. Coordinate the exact locations and mounting heights of adjustable wall units with the conditions on the wall, with other devices and equipment on the wall and with manufacturer's recommendations. For ceiling mounted units, coordinate with other ceiling mounted equipment and with reflected ceiling plans.
8. Models numbers listed below are shown for basis of design. Equal manufacturer's shall be Hubbell and Leviton.

B. Not Used.

C. Not Used.

D. Not Used.

E. Digital Timer (Janitor, storage closets and other similar areas:
1. Programmable digital timer with on-off switch, LCD display, adjustable time out settings (0 to 12 hours), adjustable time scroll on/off settings, flash and beeper warning indications of impending time out. Rated for 120/277 volts, 800 or 1200 watts as required. Suitable for mounting in a standard outlet box. Ivory housing and stainless steel coverplate. Watt Stopper TS-400. Provide 3-way digital timers where shown on plans. Provide wiring per manufacturer's instructions.

F. Sensor (Interior corridors):

1. Ceiling mounted, suitable for mounting to a standard outlet box, employing dual ultrasonic and passive infrared technology, 360 degree coverage, suitable for 24-volt operation, suitable for use with electronic ballasts and LED drivers, possessing immunity to EMI and RFI, adjustments for light level, time delay and sensitivity. Provide ivory units. Manufacturer to select angle coverage, range, number of sensing sides and other necessary parameters to suit the conditions and size of the space. Watt-Stopper DT-300 Series Ceiling Occupancy. Provide power packs as required. Provide auxiliary relay for control signal “ON” initiation to the Building Automation System (BAS) relay. Provide a separate “hot” conductor to the corridor occupancy sensors, bypassing the BAS relay, to maintain power to occupancy sensor(s) when the BAS relay is “open” (i.e. when the lighting is “off”).

EXECUTION

3.01 INSTALLATION

G. Install devices and assemblies plumb and secure.

H. Install wall plates when painting is complete.

I. Arrangement of Devices: Except as otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

J. Protect devices and assemblies during painting.

K. Adjust locations at which floor service outlets and telephone and power service poles are installed to suit the indicated arrangement of partitions and furnishings.

L. Unless noted otherwise, occupancy sensors in bathrooms to be set for 30 minute delay and all other occupancy sensors to be set for to be set for 20 minute delay.

3.02 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."
   1. Switches: Where 3 or more switches are ganged, and elsewhere where indicated, identify each switch with approved legend engraved on wall plate.
   2. Receptacles: Identify the panelboard and circuit number from which served. Mark on inside face of coverplate.

3.03 FIELD QUALITY CONTROL

A. Testing: Test wiring devices for proper polarity and ground continuity. Operate each operable device at least 6 times.

B. Test ground-fault circuit interrupter operation according to manufacturer recommendations.

C. Replace damaged or defective components.

3.03 CLEANING

A. General: Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION

SECTION 26 51 00

LIGHTING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. Related Sections:
1. Division 26 Section "Wiring Devices" for occupancy sensors.

1.3 DEFINITIONS

A. BF: Ballast factor.

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. LED: Light Emitting Diode

G. Lumen: Measured output of lamp and luminaire, or both.

H. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Ballast, including BF.
4. Energy-efficiency data.
5. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.

6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
    a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.
    b. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.
    1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
    2. Wiring Diagrams: For power, signal, and control wiring.

C. Installation instructions.

D. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

E. Field quality-control reports.

F. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
    1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

G. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

E. Mockups: Provide interior lighting fixtures for room or module mockups, complete with power and control connections.
   1. Obtain Architect's approval of fixtures for mockups before starting installations.
   2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 COORDINATION

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

1.7 WARRANTY

A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
   2. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

B. Special Warranty for LED Luminaires: Manufacturer's standard form in which manufacturer of LED luminaire agrees to repair or replace components of LED driver that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for LED Luminaires: 5 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least two of each type.
   2. Plastic Diffusers and Lenses: One for every 50 of each type and rating installed. Furnish at least one of each type.
   3. Generator Transfer Device (GTD): One for every 20 GTD’s provided.
   4. Ballasts: One for every 100 of each type and rating installed. Furnish at least one of each type.
   5. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements indicated on the lighting fixture schedule sheets E-2.60 and E.2.61.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:
   1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
      a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
      b. UV stabilized.
   2. Glass: Annealed crystal glass unless otherwise indicated.

G. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
   1. Label shall include the following lamp and ballast characteristics:
      a. "USE ONLY" and include specific lamp type.
      b. Lamp diameter code (T-4, T-5, T-8, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
      c. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
      d. ANSI ballast type (M98, M57, etc.) for HID luminaires.
      e. CCT and CRI for all luminaires.

H. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Electronic Ballasts:
   1. Comply with UL 935 and with ANSI C82.11.
   2. Designed for type and quantity of lamps served.
   3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
   4. Sound Rating: Class A
   5. Total Harmonic Distortion Rating: Less than 10 percent.
   6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
   7. Operating Frequency: 42 kHz or higher.
   8. Lamp Current Crest Factor: 1.7 or less.
   9. BF: 0.88 or higher unless otherwise noted on lighting fixture schedules
   10. Power Factor: 0.95 or higher.
   11. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

B. Electronic Programmed Rapid-Start Ballasts for T5, T8 Lamps: Comply with ANSI C82.11 and the following:
   1. Automatic lamp starting after lamp replacement.

C. Single Ballasts for Multiple Lighting Fixtures: Factory wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.

2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
   1. Lamp end-of-life detection and shutdown circuit.
   2. Automatic lamp starting after lamp replacement.
   3. Sound Rating: Class A.
   4. Total Harmonic Distortion Rating: Less than 20 percent.
   5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
   6. Operating Frequency: 20 kHz or higher.
   7. Lamp Current Crest Factor: 1.7 or less.
   8. BF: 0.95 or higher unless otherwise indicated.
   9. Power Factor: 0.95 or higher. except fixtures in apartment units may use low-power-factor electronic ballasts
   10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for non-consumer equipment.

2.5 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
   1. Lamps for AC Operation: Fluorescent, two for each fixture, 20,000 hours of rated lamp life.
   2. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
   3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
      a. Battery: Sealed, maintenance-free, nickel-cadmium type.
      b. Charger: Fully automatic, solid-state type with sealed transfer relay.
      c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
      d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
      e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
      f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
      g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.6 FLUORESCENT LAMPS

A. Flourescent Lighting Alternate Only: T8 rapid-start lamps, rated 25 W maximum, nominal length of 48 inches 2800 initial lumens (minimum), CRI 82 (minimum), color temperature 4100 K, and average rated life 20,000 hours unless otherwise indicated.

B. Flourescent Lighting Alternate Only: T8 rapid-start lamps, rated 17 W maximum, nominal length of 24 inches 1300 initial lumens (minimum), CRI 82 (minimum), color temperature 4100 K, and average rated life of 20,000 hours unless otherwise indicated.

C. Flourescent Lighting Alternate Only: T5 rapid-start lamps, rated 28 W maximum, nominal length of 45.2 inches, 2900 initial lumens (minimum), CRI 85 (minimum), color temperature 4100 K, and average rated life of 20,000 hours unless otherwise indicated

D. Flourescent Lighting Alternate Only: T5HO rapid-start, high-output lamps, rated 54 W maximum, nominal length of 45.2 inches, 5000 initial lumens (minimum), CRI 85 (minimum), color temperature 4100K, and average rated life of 20,000 hours unless otherwise indicated.

E. Flourescent Lighting Alternate Only: Compact Fluorescent Lamps: 4-Pin, CRI 80 (minimum), color temperature 41K, average rated life of 10,000 hours at three hours operation per start unless otherwise indicated.
   1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
   2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
   3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
   4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).

5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
6. 57 W: T4, triple tube, rated 4300 initial lumens (minimum).
7. 70 W: T4, triple tube, rated 5200 initial lumens (minimum).

2.7 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:
1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by Associate, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.
1. Install ceiling support system rods or wires for each fixture. Locate not more than 6 inches from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

D. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.4 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.
1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION

SECTION 27 10 00

COMMUNICATIONS EQUIPMENT AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following types of control and signal transmission media.
   1. Optical fiber cable
   2. Coaxial cable
   3. Twisted-pair cable
   4. Connectors, terminations and couplers

1.3 SUBMITTALS

A. General: Submittals for approval by the Engineer are required for all cabling and equipment covered by this section.

B. Contractor shall submit with their bid the following information:
   1. A record of RCDD on staff.
   2. A Manufacturer Certification for the system solution bid, issued directly in the bidder's company name, valid for the time frame in which the installation will be completed.

C. Submit the following to the Engineer and Miami University IT Services according to Conditions of Contract and Division 01 Specification Sections.
   1. To be submitted after installation of cabling and equipment:
      a. Field test reports indicating and interpreting test results.

D. Miami University IT Services requires the following Job Site Inspections and Reviews with the Cabling Contractor.
   1. Pre−Cabling Pathways inspection
   2. TR Room Layout & Cabling Routing Review
   3. Cable Label Review (Cabling Contractor to provide label sample)
   4. Cabling Rough−In Inspection
   5. Final Review and TR Turnover

E. After Miami University IT Services has Network Electronics installed, tested and operational the Cabling Contractor shall install & label the Wireless Access Points (WAPs) provided by the Owner, and provide a drawing marked up with WAP locations and MAC addresses.

F. Submit the following to the Owner as soon as the installation of the cabling and equipment is complete:
   1. Provide as-built drawing electronically in AutoCad format as well as two copies of record drawings of completed project showing cable runs and location numbers assigned to rooms.
   2. Transfer to Miami University IT Services the manufacturer's warranties in addition to the general system warranty.

1.4 QUALITY ASSURANCE

A. Only installers trained and certified by the proposed manufacturer shall be allowed to install products. Installers must possess the highest level of certification available by the manufacturer for the specific cabling solution being installed. Cabling Contractor must be Panduit and Belden certified as well as Corning Cable Systems as an EWP partner.

B. Cabling Contractor shall schedule and conduct a coordination meeting with Miami University IT Services to confirm and coordinate scope of work requirements prior to commencement of work. Project meetings shall be scheduled through the Project General Construction Manager.

C. Miami University reserves the right to reject any unregistered or uncertified installers performing work for which they are not registered/certified. The Cabling Contractor shall be responsible for any loss of work, delays in schedules, or extra cost as a result of the use of unregistered/uncertified workers. Additional effort on the part of the Cabling Contractor to maintain the installation schedule as a result of the above mentioned loss time shall be the Cabling Contractor's responsibility and at the Cabling Contractor's additional expense.

D. Standards are based on NFPA 70 (NEC), National Electrical Safety Code (NESC), Institute of Electronic and Electrical Engineers IEEE, ANSI/TIA/EIA Telecommunication Standards, and BICSI methodologies. The requirements within those documents are not superseded unless specifically stated. As required, NEC and NESC code requirements cannot be superseded by this document at any time. ANSI/TIA/EIA standards and BICSI methodologies may be superseded, as specified, or may be made stricter by this document. The absence of a specific reference to an element of these codes, standards, and methodologies does not relieve all parties of compliance with them.

E. All new materials, equipment, and installation practices shall comply with accepted standards of workmanship as recognized by:
   1. Building Industry Consulting Service International (BICSI)
      a. Telecommunications Distribution Methods Manual (TDMM) most recent, edition.
      b. Information Transport Systems Installation Manual most recent edition.
   2. Miami University Outside Plant Design Manual (CO−OSP) most recent, edition.

F. Modifications made to the existing copper OSP cabling and fiber optic entrance shall be performed by the Cabling Contractor providing the warranty on the cables.

1.5 WARRANTY

A. Contractor shall be Panduit and Belden Warranty providers, only one manufacturer 25 year warranty need be provided. All fiber work must be completely installed by a Corning EWP partner and full 25 year warranty provided.

B. Post-System Warranty Maintenance Service:
   1. Miami University shall reserve the right to elect or cancel at any time any maintenance service to be provided by the Cabling Contractor.
   2. Warranty of On-Site Response: Regardless of the cause of the problem, the Cabling Contractor shall ensure that parts, equipment, and materials are available to remedy the problems and its personnel are ready to begin work (such action being deemed a "response")
   3. Warranty of Security: Cabling Contractor shall warrant that its personnel, including all subcontractors, shall at all times comply with all Miami University security regulations of which contractor has been informed by Miami University. Cabling Contractor also warrants that it has obtained all necessary licenses and permits required by federal, state and local government.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Reference brands and part numbers listed herein are basis of design. Voluntary alternates shall meet or exceed specifications for the items listed. Acceptance of products, other than those listed as approved shall be at the sole discretion of Miami University IT Services.

B. All approved brands and part numbers shall be listed in Appendix B at the end of this document.

2.2 GROUNDING AND BONDING

A. Bus Bars for Communications (BICSI Pattern)
   1. Approved Manufacturers: Panduit Corporation
   2. Approved PƒN's for PBB (Primary Bonding Busbar), SBB (Secondary Bonding Busbar) and RBB (Rack Bonding Busbar) may be found in Appendix B.

B. H−TAPs kits for Communications
   1. Approved Manufacturers: Panduit Corporation
   2. Approved PƒN's for H−TAPs may be found in Appendix B.

C. RBCs (Rack Bonding Conductors) for Communications
   1. Approved Manufacturers: Panduit Corporation
   2. Approved PƒN's for RBCs may be found in Appendix B.

D. UBCs (Unit Bonding Conductors) for Communications
   1. Approved Manufacturers: Panduit Corporation
   2. Approved PƒN's for UBCs may be found in Appendix B.

E. ESD (Electro−Static Discharge) for Communications

1. Approved Manufacturers: Panduit Corporation
2. Approved P∫N's for UBCs may be found in Appendix B.

2.3 HANGERS AND SUPPORTS

A. Approved Manufacturers: Panduit Corporation
   1. J−Mod and J−Pro Cable Support System.

2.4 IDENTIFICATION

A. Approved Manufacturers: Panduit Corporation

B. All labeling conventions and products shall be in compliance with ANSI/TIA/EIA−606−B, Administration Standard for Commercial Telecommunications Infrastructure.

2.5 FIRESTOPPING DEVICES

A. Approved Manufacturers: STI, E−Z Path Series

B. The approved pathway through wall penetrations, up to 8 inches thick, is the E−Z Path (sleeve system) by STI. The Contractor shall identify penetration points for horizontal cabling, but must obtain pre−approval from the electrical engineer prior to installation.

C. For cable tray penetrations through rated walls, intumescent firestop pillows shall be installed. E−Z Path Series SSB Firestop Pillows or the equivalent.

D. For floor penetrations thicker than 8 inches, the use of metallic conduit shall be approved. Metallic conduit sleeves shall be 4 inches minimum. The electrical engineer shall preapprove the size, quantity, and locations of the pathways. Refer to Division 26.

2.6 COMMUNICATIONS ENTRANCE PROTECTION

A. Approved Manufacturers: Porta Systems

B. Building Entrance Terminals
   1. Multi-pair indoor protector packs shall be constructed of metal housing with fire resistant plastic connecting block containing mountings for twenty-five (25) gas tube protector modules.
   2. Panels shall comprise a 66-block form factor for side-by-side and top-to-bottom installation and shall be mounted on a 66-block bracket. Both input and output terminations shall be 66-style.

2.7 COMMUNICATION RACKS AND FRAMES

A. Approved Manufacturers: Panduit Corporation, CPI

B. Approved P/N's for Racks and Frames may be found in Appendix B.

2.8 COMMUNICATION TERMINATION BLOCKS AND PATCH PANELS

A. Termination Blocks for copper horizontal “analog” station
   1. Approved Manufacturers: Emerson Network Power
   2. Approved P/N’s for Termination Blocks may be found in Appendix B.

B. Patch panels for copper horizontal “data/voice/video” station cabling (at main communications room(s) and telecommunications room(s):
   1. Approved Manufacturers: Panduit Corporation
   2. Approved P/N’s for Patch Panels may be found in Appendix B.

2.9 COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

A. Cable Management
   1. Vertical Cable Management for Racks/Frames
      a. Approved Manufacturers: CPI
      b. Approved P/N’s for Vertical Cable Management may be found in Appendix B.
   2. Horizontal Cable Management for Racks/Frames.
      a. Approved Manufacturers: Panduit Corporation
      b. Approved P/N’s for Horizontal Cable Management may be found in Appendix B.

B. Ladder Rack and Accessories
   1. Approved Manufacturers: CPI, Homaco
   2. Approved P/N’s for Ladder Rack and Accessories may be found in Appendix B.

2.10 COMMUNICATIONS COPPER BACKBONE CABLING

A. Copper Backbone Cabling − Intra−building
   1. Approved Manufacturers: General Cable, Commscope, Superior Essex
   2. Approved P/N’s for Copper Backbone Cabling − Intra−building may be found in Appendix B.

B. Copper Backbone Cabling − Inter−building (OSP)
   1. Approved Manufacturers: General Cable, Commscope, Superior Essex
   2. Approved P/N’s for Copper Backbone Cabling − Inter−building (OSP) may be found in Appendix B.

C. Copper Backbone Splicing − Inter−building Only (OSP)
   1. Approved Manufacturers: General Cable
   2. Approved P/N’s for Copper Backbone Cabling − Inter−building (OSP) may be found in Appendix B.

2.11 COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING

A. Optical Fiber Backbone Cabling
   1. Approved Manufacturers: Corning
   2. Approved P/N’s for Optical Fiber Backbone Cabling may be found in Appendix B.

B. Optical Fiber Connectors

1. Approved Manufacturers: Corning
2. Approved P/N's for Optical Fiber Connectors may be found in Appendix B.

C. Distribution Panels for Optical Fiber Backbone Cabling:
1. Approved Manufacturers: Corning
2. Corning Optical Fiber Distribution Panels shall be CCH series.
3. Approved P/N's for Distribution Panels for Optical Fiber Backbone Cabling may be found in Appendix B.

2.12 COMMUNICATIONS HORIZONTAL CABLING

A. Approved Manufacturers:
1. Category 6A: General Cable − Blue in color (#7132850, #7133850)
2. Category 6: General Cable − White in color (#7133901, #7131901), Belden − White in color (#3612, #3613)

2.13 COMMUNICATIONS FACEPLATES AND CONNECTORS

A. Faceplates
1. Approved Manufacturers: Panduit Corporation, Randl
2. Approved P/N's for Faceplates may be found in Appendix B.

B. Copper Connectors
1. Approved Manufacturers: Panduit Corporation
2. Approved P/N's for Copper Connectors may be found in Appendix B.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine raceways and other elements to receive cable for compliance with installation tolerances and other adverse conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General
1. All communications pathways and cable supports shall be sized and installed to accommodate Category 6A cabling.

B. Grounding and Bonding
1. Bus Bars
a. All communications spaces including, but not limited to Main Communications Room (MCR) and Telecommunications Room (TR) shall require a Primary Bonding Busbar (PBB) or Secondary Bonding Busbar (SBB).
b. The PBB/SBB shall be bonded to an appropriately sized Bonding Conductor for Telecommunications (BCT) bonding conductor as well as to the Telecommunication Bonding Backbone (TBB) using two-hole compression connectors.

c. Location of the position of the PBB/SBB shall be determined by Miami University IT Services.

2. Conductors
   a. Route conductors on short direct paths that have minimum resistive and inductive impedance as follows:
      1) Bonding conductors shall be routed with minimum bends or changes in direction.
      2) Minimum of 8−inch bend radius and/or 10x the diameter of the conductor is to be maintained.
      3) Bonding connections shall be made directly to the points being bonded.
      4) Bonding conductors shall be continuous and void of splices.
   b. Bus bars may be bonded to structural steel as a telecommunications bonding backbone. Impedance testing shall be required to confirm potential steel within entrance facilities and communications spaces as being properly grounded and available for use as a grounding conductor.
   c. Structural steel used as lightning down conductors shall not be used as a TBB.
   d. Furnish and install a conductor from any bus bar to metallic cold water pipes within the room.
   e. Sizing of TBB will be per Rable 1 in Appendix A.
3. Bonding
   a. Furnish and install bonding conductors from all telecommunications bus bars to any electrical service panels, structural steel, and cold water pipes within the MCR, TR(s), EF, and any other information transport systems distribution spaces.
   b. Self-tapping screws, or any other type of screw, shall not be used to form bonds or attach grounding hardware. All specified bonds shall be irreversible compression connectors.
   c. Test all grounding conductors for resistance:
      1) 1) < 0.1 ohm
   d. Test all grounding conductors for current:
      1) AC: <*f* = 1 A
      2) 2) DC: <*f* = 500ma
   e. Bonding shall be per Figure 1 in Appendix A.

C. Hangers and Supports
1. Communications cabling shall be contained within a combination of open spaces, enclosed conduits, raceways, and cable pathways and physical layouts. These pathways are designed to provide the capacity to properly install high performance communications cabling for present and future applications.
2. Cables shall be neatly routed and bundled above the suspended ceiling structure in bundles limited to a quantity of cables as per manufacturer specifications and installation practices for Category 6 UTP, Category 6A or F/UTP as applicable to the media being installed. High performance sling−type supports shall be used for adds/moves/changes or low cable count pathways.
3. High performance J−Hook supports shall also be used.
4. Suspended ceiling support wires shall not be used for cabling support. Cables shall not be laid directly on ceiling tiles or rails. Cables placed in hangers in the ceiling area shall be routed high and away from all other electrical and

mechanical systems so as to avoid contact with light fixtures, ventilation ducts, sprinkler system or plumbing piping, motors or any other electrical devices.

5. The maximum separation between support points for all cabling shall be five (5) feet.
6. All cable pathway support elements shall be certified by the manufacturer for a high performance twisted pair installation, when applicable. In all cases, support products shall be approved for the support of Category 6A or higher cables, including optical fiber.

D. Cable Routing, Separation, and Distance

1. Whenever possible, primary cable routing paths shall follow the logical structure of the building. When a wall must be breached, provide sleeved openings. Cabling shall enter and exit these areas at 90° angles. Route all cables and cable raceways parallel to or perpendicular to building structure. No diagonal runs shall be permitted, unless noted otherwise.
2. To reduce or eliminate the field effect of EMI on data signaling, cable runs shall be kept a minimum distance from EMI sources.
   a. Minimum separation distance from possible sources of EMI:
      1) 5 inches (125mm) from power lines of 2 KVA or less.
      2) 12 inches (305mm) from lighting fixtures.
   b. Minimum separation distance from possible sources of EMI exceeding 5KVA:

Condition	Min. Separation Distance
Unshielded power lines or electrical equipment in proximity to open or non-metal pathways.	24 in. (610 mm)
Unshielded power lines or electrical equipment in proximity to a grounded metal conduit pathway.	12 in. (300 mm)
Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal conduit pathway.	6 in. (150 mm)
Electrical motors and transformers.	47 in. (1200 mm)

3. Communications cabling shall not be run in parallel with any high voltage electrical wiring.
4. Communications cables shall maintain a minimum separation of 2−inches (50mm) from bonding conductors.
5. The maximum length of horizontal communications cables shall be limited to 90 meters from the Telecommunications Outlet (TO) to the MCR or TR point of termination.
6. Cable routing from the ladder tray onto the distribution frame shall be neatly organized and supported by cable support brackets, clips, loops, radius drops, spools, etc., as required to minimize tension and stress on the connector block terminations.

E. Conduit Chase Pipes

1. Furnish and install 4 inch EMT conduit "Chase Pipes" within MCR, TR, EF, and other information transport system spaces where communications cabling must pass through suspended ceiling tiles enroute to point of cabling termination.
2. Chase Pipes shall be securely mounted to the wall above ladder tray segments using slotted Unistrut and 4−inch pipe clamps. Reamed and bush pipes at both ends prior to cabling rough−in.

F. Communications Entrance Protection
1. All OSP cables entering any building shall be properly protected and bonded to ground at both ends of the circuit.
2. Building Entrance Terminal shall be located on the leftmost section of plywood backboards and organized in columns, unless otherwise directed by the Owner. Existing station and riser cabling shall be located to the right of the feed and riser columns. Feed and station blocks shall not be mixed within a single column.
3. Ground all panels using solid 6AWG green insulated conductors direct to the SBB or PBB.
4. Configuration, where multiple BETs are implemented, shall be such that interconnecting grounding conductors are routed as straight as possible and directly attached to the SBB or PBB.
5. Contractors shall not inter−connect BETs with horseshoe−shaped conductors.
6. Bond protectors to cable bonding clamps.

G. Communication Racks and Frames
1. Open Frame Equipment Racks - Single Upright, 2-Post.
   a. Racks shall be mounted to allow a minimum of 36 inches access space in both front and rear. Racks shall be bolted to the floor. The tops of the racks shall be securely braced to rigid ladder tray and bracketed to the wall. All hardware shall be provided for protection within seismic zones, where applicable.
   b. The sides of a rack or group of racks situated against a wall shall abut and extend from the wall. Clearance for the access "walk around" end shall be 36 inches at minimum.
   c. All racks shall be attached to the floor in four places using appropriate floor mounting anchors. When placed over a raised floor, threaded rods should pass through the raised floor tile and be secured in the structural floor below. (Use CPI #40604−003 for concrete slab floors or #40607−001 wood floors. Raised floor support kits are also available.)
   d. All Racks shall be individually (home−run) bonded to the SBB or PBB using appropriate hardware.
   e. Ladder rack shall be attached 6 inches from the top of the rack to deliver cables to the rack using appropriate radius control "waterfall" kits. Use appropriate hardware from the ladder rack manufacturer to attach ladder rack.
   f. Vertical Cable Management shall be attached to the sides of the rack to deliver cables to the rack. Use appropriate hardware from the cable management manufacturer to attach ladder rack.
2. Labeling
   a. General: Mechanically printed, adhesive labels shall be used in all cases except for 66 blocks. Labels shall have a white background with black lettering. Brady ID Pro label tape (or equal) is required for the riser and

station jacket labels. Brother P−Touch (or equal) labels are required for all other labels.

b. Rack Labels: Each rack shall contain a label bearing the building and TR designation, followed by a dash and letter designation, indicating which rack it is in sequence. Example: for racks located within in TR PSY206, the first rack will be labeled 'PSY206− A', the second 'PSY206−B', etc. Rack labels will be placed on the front, upper left hand corner of each rack, viewed when facing the rack.

H. Communication Termination Blocks and Patch Panels

1. Labeling − Labeling samples must be submitted and accepted by owner.
2. Mechanically printed, adhesive labels shall be used in all cases except for 66 blocks. Labels shall have a white background with black lettering.
3. 66 Blocks: 66 block labels are to be legibly handwritten, using a fine point black Sharpie, or other indelible/permanent marker. For riser blocks, the number of the riser count shall be placed at the first white/blue position, followed by every fifth pair number afterward. For station blocks, the numbers in the outlet ID shall be used, placed at the white position of the white/blue pair. Example: 203−1−T1 shall be labeled '203−1'. In cases where there is a T3, etc. this shall be written on the blue position of the white/blue pair, under the outlet ID numbers.
4. Patch Panels: Each installed patch panel shall have a mechanically printed label attached in the upper left−hand corner of the panel, containing the TR number, the letter of the rack in which it is installed, and the letter identifying the panel, separated by dashes. Example: The first panel in the second rack of TR ROB206 would be labeled 'ROB206B−A'.
5. Patch Panel Ports: Each patch panel port shall have a mechanically printed label attached below the port to indicate the far end connection information. The label will contain the outlet number, the location number, and the jack number, separated by dots.
6. Fiber Optic Hardware: Each fiber−optic cabinet will contain a label in the upper left−hand corner of the door, with FT followed by the two−digit number of the panel. The first cabinet will be labeled 'FT01', the fifth Cabinet 'FT05', etc. The cabinet's interior label strip will be as follows. For each column, a label containing the originating TR and cabinet label (FTxx) separated by a slash, followed by the destination TR and cabinet label (FTxx) followed by the strand (element) count for each coupler panel position. Example: Cable CAB125T*f*ROB204−1 is terminated into coupler panel positions A−G in FT01 and at CAB125T and FT02 at ROB204. Column 'A' on the fiber cabinet pullout strip will contain this label, installed vertically down the column: 'CAB125T FT01 / ROB204 FT02 1−12'.

I. Communications Cable Management and Ladder Rack

1. Vertical Cable Management
   a. Vertical Cable Management sections, 84 inches, shall be bolted−in between all Open Frame Racks.
   b. Vertical Cable Managers shall be attached to the side of the Rack/Frame using the manufacturer's installation instructions and included hardware. No holes shall be drilled in Racks/Frames in order to install mismatched managers.
   c. When a single Vertical Cable Manager is used in between two Racks/Frames, attach the Vertical Cable Manager to both Racks/Frames.

d. When more than one (1) Vertical Cable Manager is used on a Rack/Frame or group of Racks/Frames, use the same make, style and size of Vertical Cable Manager on the Rack/Frame or in between Racks/Frames.
e. The color of the Racks/Frames and Vertical Cable Managers shall match.

2. Horizontal Cable Management: All Managers shall be securely mounted in the rack with a minimum of four (4) rack screws located in the four corners of each panel.
3. Ladder Rack
   a. Ladder Rack shall be installed with side stringers facing down so that the ladder forms an inverted U−shape and so that welds between the stringers (sides) and cross members (middle) face away from cables.
   b. Ladder Rack shall be supported every 5 feet on center with 5ƒ8−inch diameter threaded rod, or applicable support brackets or racks. Exposed portion of threaded rod shall be protected with tubular cover throughout the portion of the rod exposed to cabling within the maximum fill area.
   c. Ladder Rack shall be supported every 5 feet or less in accordance with TIA−569−B. Ladder Rack shall be supported within 2 feet of every splice and within 2 feet on both/all sides of every intersection. Support Ladder Rack within 2 feet on both sides of every change in elevation. Support Ladder Rack every 2 feet when attached vertically to a wall.
   d. Heavy−duty splices are required for Ladder Racks exceeding 18 inches in width. Heavy− duty splices are required for any splice formed in the vertical orientation including changes in elevation formed using vertical−to−horizontal 90˚ turns or horizontal−to−vertical 90˚ turns. Use heavy−duty splices to secure all overhead turns to the overhead horizontal pathway(s).
   e. When the pathway is overhead, Ladder Rack shall be installed with a minimum clearance of 12 inches above the Ladder Rack. Leave a minimum of 12 inches in between Ladder Rack and ceiling/building truss structure. Leave a minimum of 3 inches in between Ladder Rack and the tops of equipment racks and/or cabinets. Multiple tiers of Ladder Rack shall be installed with a minimum clearance of 12 inches in between each tier of Ladder Rack. When located above an acoustical drop ceiling, leave a minimum of 3 inch clearance between the top of the drop ceiling tiles and the bottom of the Ladder Rack.
   f. Use a radius drop to guide cables wherever cable exits overhead Ladder Rack to access a rack, cabinet or wall−mounted rack, cabinet or termination field. Furnish and install a moveable cross member also to attach and align the radius drop in between the welded cross members of a Ladder Rack.
   g. Whenever possible, maintain a 2 feet separation between Ladder Rack used for communications cables and pathways for other utilities or building services.

J. Communications Copper Backbone Cabling
   1. Intra-building
      a. The Contractor shall use common vertical sleeve(s) for routing of all copper intra−building backbone/riser cables. Cables shall be supported vertically within the MCR and TR spaces using wall mounted ladder rack and Erico/Caddy CableCat Vertical Backbone Cable Support.

b. Place cables without exceeding cable manufacturer's recommended pulling tensions.
    1) Pull cables simultaneously if more than one is being pulled in the same raceway.
    2) Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
    3) Use pulling means, including fish tape, cable, rope, and basket weave or cable grips, that will not damage cabling or raceways.
c. The Contractor shall secure all copper intra−building backbone cables to the MCR walls to prevent movement of the cable. D−rings shall be acceptable for this purpose. The Contractor shall secure the cables to the Ladder rack to prevent movement of the cable. The Contractor shall use the horizontal Ladder Rack to route the cable to the MCR termination blocks.
d. Within the MCR, the Contractor shall furnish a ten (10) foot service loop suspended from the Ladder Rack above the MC frame.
e. All cabling shall be continuous and without splices, except to attach to BETs.
f. Bond and ground all cable shields and drain wires at each end.
g. Category 3 Riser Cables shall be terminated on 66 blocks separate from those used for Station Cable and shall be mounted on plywood backboard.
    1) Riser cable shall be routed from the overheard ladder rack around the perimeter of the plywood using metal D−Rings.
    2) All cabling shall approach the point of termination from the bottom, entering in the bottom of the block.
    3) All cables shall be neatly organized and dressed (combed) using plastic tie wraps with metal reinforced locking tabs.
    4) Cable management hardware shall be furnished and installed by the contractor to ensure that the installation is neatly organized and readily identifiable.
    5) Riser and Station cabling may be routed using the same metal D−Rings.

2. Inter−building
    a. OSP (Outside Plant) multi−pair copper backbone cables from other buildings shall break for termination and protection within an SE (Service Entrance) within 50 ft. of the point at which cabling exits rigid entrance conduit. Cabling shall then be converted to UL® tested and listed CMR or CMP ISP as required for the environment into which it is to be placed and routed directly to the MC located in the MCR.
    b. OSP Copper Backbone Cabling shall be RUS/REA PE89 design in conformance with ANSI ICEA 7CFR−1755.890, foam skin filled core, multi−pair 24AWG, at minimum. Transition cabling from the SE splice to the termination panel shall be AR Series Riser cable (ARMM).
    c. All OSP cables entering any building shall be properly protected and bonded to ground at both ends of the circuit.
    d. Contractor shall furnish and install BET (Building Entrance Terminals) with primary protection modules.
    e. The Contractor shall use common conduits and sleeve(s) for routing of all copper inter− building cables. Cables shall be supported vertically within the MCR and TR spaces using wall mounted ladder rack and Erico/Caddy CableCat Vertical Backbone Cable Support.

f. Place cables without exceeding cable manufacturer's recommended pulling tensions.
    1) Pull cables simultaneously if more than one is being pulled in the same raceway.
    2) Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
    3) Use pulling means, including fish tape, cable, rope, and basket weave or cable grips, that will not damage cabling or raceways.
g. The Contractor shall secure all copper inter−building cables to the MCR walls to prevent movement of the cable. D−rings shall be acceptable for this purpose.
h. The Contractor shall secure the cables to the Ladder rack to prevent movement of the cable.
i. The Contractor shall use the horizontal Ladder Rack to route the cable to the MC termination blocks.
j. Within the MCR, the Contractor shall furnish a ten (10) foot service loop suspended from the Ladder Rack above the MC frame.
k. All cabling shall be continuous and without splices, except to attach to BETs.
l. Bond and ground all cable shields and drain wires at each end.
m. Cabling shall be arranged on the termination blocks in sequential numerical order by cable pair.
n. Copper Backbone Cabling shall be terminated on 66−style termination blocks at the MC.

3. Testing
    a. New cable pairs shall be end−to−end tested as follows:
        1) DC loop resistance
        2) Wire map
        3) Continuity to remote end
        4) Shorts between two or more conductors
        5) Crossed pairs
        6) Reversed pairs
        7) Split pairs
    b. All balanced twisted−pair field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated in the manuals provided with the field test unit.
        1) The calibration certificate shall be provided for review prior to the start of testing.
        2) Testers shall require a 66−style adapter.
    c. Autotest settings, provided in the field tester for testing the installed cabling, shall be set to the manufacturer default parameters for the type and characteristics of the cable to be tested.
    d. Tests shall be performed with connectors and termination completed and in−place.
    e. Any cable or component not satisfactorily passing the tests as described or failing to meet quality installation standards as described in this specification, shall be repaired and/or replaced at the Contractor's expense.
    f. The Contractor shall prepare complete cable test reports for all installed cables for review and approval of the University prior to acceptance of the cabling system.

g. A copy of the final completed and reviewed cable test reports shall be enclosed in clear vinyl protective covers and posted in the wiring closet for use and reference by the University.

4. Labeling
   a. Labeling shall be furnished and installed by the Cabling Contractor according to the following details.
      1) Cabling Contractor shall make early contact with Miami University IT Services (through the General Construction Project Manager) to obtain the three−letter identifier and any other special requirements for each project. Example labels are available upon request.
      2) A sample of the labeling shall be submitted to the University for approval prior to installation.
   b. Mechanically printed, adhesive labels shall be used in all cases except for 66 blocks. Labels shall have a white background with black lettering.
   c. All OSP Fiber and Copper Jacket Labels shall be labeled using a mechanically printed label, designed for use on cable sheathing, at each end.
      1) Labels shall contain the three−letter identifier and room number for the start and end destination TRs, followed by the sequence number and strand (element) or pair count.
      2) Cable jacket labels will be installed between 6 inches and 10 inches from the terminated cable end.
      3) All cable labels shall be mechanically printed, wrap−around self−laminating type.
   d. All Riser Cable Jacket (both copper and fiber) cables shall be labeled using a mechanically printed label, designed for use on cable sheathing, at each end.
      1) Labels shall contain the three−letter identifier and room number for the start and end destination TRs, followed by the sequence number and strand (element) or pair count.
      2) All cable labels shall be mechanically printed, wrap−around self−laminating type.

K. Communications Optical Fiber Backbone Cabling
   1. The Contractor shall use common vertical sleeve(s) for routing of all optical inter−building backbone/riser cables.
   2. Cables shall be supported vertically within the MCR spaces using wall mounted ladder rack and 4 to 6 inch metal D−Rings or Erico/Caddy CableCat Vertical Backbone Cable Support.
   3. All optical fiber cabling shall be installed within conduit.
   4. Place cables without exceeding cable manufacturer's recommended pulling tensions.
      a. Pull cables simultaneously if more than one is being pulled in the same raceway.
      b. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
      c. Use pulling means, including fish tape, cable, rope, and basket weave or cable grips, that will not damage cabling or raceways.
   5. The Contractor shall secure all optical intra−building backbone cables to the MCR walls to prevent movement of the cable. D−rings shall be acceptable for this purpose.

a. The Contractor shall secure the cables to the Ladder rack to prevent movement of the cable.
b. The Contractor shall use the horizontal Ladder Rack above each of the Open Frame Rack(s).

6. Contractor shall include a minimum of fifty (50) foot single service loop, secured to the TR backboard prior completing the run to the optical fiber distribution panel within the floor mounted equipment rack.
7. All Intra−building cabling shall be continuous and without splices of any kind.
8. All MCR−to−TR fiber cabling shall be in an armored jacket when not in conduit.
9. Bond and ground all interlocking armor, where applicable, at each end of the cable to telecommunications grounding system.
10. Cabling shall be arranged on the distribution panels in sequential numerical order by individual element according to optical fiber color code.
11. Optical Fiber Backbone Cabling shall be terminated as follows:
    a. Optical Fiber Distribution Panels shall be rack mount Corning CCH variety.
    b. Each panel shall include a full complement of blank adapter panels, labels, cable storage accessories, and optical fiber cable routing accessory kit.
    c. The last 6 duplex singlemode fibers shall be "LC−APC" style duplex adapters and shall be color coded according to the optical fiber type for which they are applied. 8.3ƒ125 □m single mode shall be g
12. Prior to shipment, both cable ends shall be sealed with a waterproof cap to prevent moisture from entering the cable.
13. The cable reel shall be shipped with OTDR results for each fiber. OTDR results shall show attenuation and bandwidth. The results shall be documented in such a manner that the information can be retained for future use.
14. Certification Testing
    a. Panduit CPI or Corning EWP is required to pre−form any and all fiber work. Full Corning Warranty is required on all fiber cables.
    b. Full testing shall be performed on each cabling segment (connector to connector). Perform the following tests and inspections and prepare full reports to be submitted immediately upon completion of each phase of construction as well as for inclusion in O&M Manuals.
    c. The Cabling Contractor, installer, tester, and warranty issuer shall be employed by the same firm.
15. Labeling
    a. Labeling shall be furnished and installed by the contractor according to the following details.
        1) Contractor shall make early contact with University IT Services (through the Project Manager) to obtain the three−letter identifier and any other special requirements for each project. Example labels are available upon request.
        2) A sample of the labeling shall be submitted to the University for approval prior to installation.
    b. Mechanically printed, adhesive labels shall be used in all cases except for 66 blocks. Labels shall have a white background with black lettering.
        1) Brady ID Pro (or equal) label tape is required for the riser and station jacket labels.
        2) Brother P−Touch (or equal) labels are required for all other labels.
    c. All OSP Fiber and Copper Jacket Labels shall be labeled using a mechanically printed label, designed for use on cable sheathing, at each end.

1) Labels shall contain the three−letter identifier and room number for the start and end destination TRs, followed by the sequence number and strand (element) or pair count.
2) Cable jacket labels will be installed between 6 inches and 10 inches from the terminated cable end.
3) All cable labels shall be mechanically printed, wrap−around self−laminating type.

d. All Riser Cable Jacket (both copper and fiber) cables shall be labeled using a mechanically printed label, designed for use on cable sheathing, at each end.
1) Labels shall contain the three−letter identifier and room number for the start and end destination TRs, followed by the sequence number and strand (element) or pair count.
2) All cable labels shall be mechanically printed, wrap−around self−laminating type.

L. Communications Horizontal Cabling
1. Horizontal copper cabling runs shall be placed in one continuous end−to−end length between the (Main) Telecommunications Room(s) and the WAO without splices of any kind.
2. Contractor shall be responsible for determining the route and quantity of J−Hooks and other independent cable supports within the overhead ceiling space wherein cable tray or other support systems.
a. Attaching or otherwise draping cables to ceiling wire grid, pipes by other trades, lighting fixtures, etc. shall not be permitted.
b. J−Hooks and other independent cable supports shall be located on 48" to 60" centers to adequately support and distribute the cable weight.
c. Where J−Hooks and independent cable supports are used, runs shall follow walls and building supporting structures; diagonal runs shall not be acceptable.
3. In certain special cases, Voice Station Cables shall be terminated on 66 blocks separate from those used for Riser cable and shall be mounted on plywood backboard. Each column of Station blocks shall be mounted with a vertical spacing of 4", measured from the centerline of each column.
a. Half D−Rings shall be furnished and installed for cross−connect management with a quantity of two (2) at the top of each column.
b. The Station cables shall be routed from the overhead ladder rack to a designated corner of the TR. From there, they will be routed to comprise a long service loop of cable upon the ladder rack of the TR. The length of this service loop shall be sufficient to re−terminate all cables within new rack mounted Patch Panels as needed in the future. After the service loop, all cabling shall be routed through metal D−Rings and approach the point of termination from the bottom, entering in the bottom of the block.
c. All cables shall be neatly organized and dressed (combed) using Velcro strap material (instead of tie wraps).
d. Cable management hardware shall be furnished and installed by the contractor to ensure that the installation is neatly organized and readily identifiable.
4. Data/Voice/Video Station Cables shall be terminated on rack mounted patch panels within the designated TR according to EIA/TIA T568B wire map.
a. Unused spaces on patch panels shall be left vacant.

b. All cables for data service shall be neatly organized and dressed following industry−standard practices and in conformance with installation standards of BICSI ITS Installation Methods Manual specifications.
c. Each patch panel start with the lowest outlet location number and increase in sequence from left to right, top to bottom.
d. Panels shall be arranged so that the first outlet on each floor begins on a new panel where possible.
e. The Station cables shall be routed from the overhead ladder rack to a designated corner of the TR. From there, they will be routed to comprise a long service loopof cable upon the ladder rack of the TR. The length of this service loop shall be sufficient to pull back and re−terminate cables, as needed in the future, on wall mounted 66 blocks in the event cables must be hard−wired for life−safety, or other reasons, as required by the University.
f. All cables shall be neatly organized and dressed (combed) using Velcro strap material (instead of tie wraps).
g. Cable management hardware shall be furnished and installed by the contractor to ensure that the installation is neatly organized and readily identifiable.

5. Certification Testing
   a. Tests shall be performed with connectors and termination completed and in− place. All new cable pairs shall be 100% tested and passed by the criteria as established herein:
   b. Test equipment shall be equipped with the most current software upgrades to meet applicable testing standards.
      1) Calibration of the testing instruments shall be current as per the manufacturer's requirements.
      2) Test cords, adapters, and connectors shall be maintained in good order.
      3) Test instruments must be identified on the applicable summary test forms as to make, model, software generic, and calibration date.
   c. Full testing shall be performed on each permanent link (Patch Panel to Patch Panel and Patch Panel to Work Area Outlet) by trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof.
      1) The test of each link shall include all of the parameters as detailed below. In order to pass, the test measurements must all meet or exceed the limit value determined in the TIAƒEIA Standard.
      2) Perform and record the tests and prepare full reports for inclusion in O&M Manuals.
   d. The Contractor shall produce summary test reports to be accepted by the University at the completion of each project phase.
      1) Test reports shall be completely and legibly filled out, dated, and signed by the person performing the tests.
      2) The completed forms shall be submitted to the Engineer for review and acceptance for authorization to proceed into the next installation phase.

6. Labeling
   a. Labeling shall be furnished and installed by the contractor according to the following details.

1) Contractor shall make early contact with University IT Services (through the Project Manager) to obtain the three−letter identifier and any other special requirements for each project. Example labels are available upon request.
2) A sample of the labeling shall be submitted to the University for approval prior to installation.

b. Mechanically printed, adhesive labels shall be used in all cases except for 66 blocks. Labels shall have a white background with black lettering.
1) Provide Brother P−Touch labels for all faceplate labels.

c. All Station Cable Jacket cables will be labeled using a mechanically printed label, designed for use on cable sheathing, at each end.
1) Labels will contain the outlet number, location number, and jack number on one line, separated by dashes.
2) The telecommunications room designation in which the cable is terminated shall be contained on a second line.
3) Cable jacket labels will be installed between 6 inches and 10 inches from the terminated cable end.

d. All cable labels shall be mechanically printed, wrap−around self−laminating type.

M. Communications Faceplates and Connectors
1. Outlet configurations shall be:
a. “D−WALL” − Randl 5 square outlet box with Single−gang mud ring containing a biscuit jack for wall phone application.
b. “D, 2D, 3D, or 4D” − Randl 5 square outlet box with Single−gang mud ring and faceplate for data, voice, and video applications.
c. “4D, 5D, 6D, 7D or 8D” − Randl 5 square outlet box with Double−gang mud ring and faceplate for data, voice, and video applications.
d. “D−WAP” − Biscuit−jack with data for wireless above drop−ceiling with 10 foot cable coil.
e. “DOS−WAP” − Biscuit−jack with data for outside wireless terminated into a Randl 5 square outlet box (refer to drawing for details)
f. “D-S” – Randl 5 square outlet box with single-gang mud ring. Cover plate is not required. One category 6 data cable with 8P8C modular male connector. Connect to a wireless access point. Cable shall be provided with a 12”-18” “pig-tail”. Contractor shall install University furnished wire access point.
g. “C” – Biscuit-jack with one RJ-45 modular jack above accessible ceiling with 10 foot cable coil; or biscuit-jack with one RJ-45 modular jack in a Randl 5 square outlet box with single-gang mud ring, in dry-wall ceiling or wall, for camera installation.
2. Certification Testing
a. Testing shall be performed only after faceplates and outlets have been fixed in final position. Under no circumstances shall testing shall be performed while outlets are hanging loose, prior to being permanently "settled" into their backbox or surface box.
b. Full testing shall be performed per “Data/Voice/Video Station Cables” testing above.
3. Labeling
a. Labeling shall be furnished and installed by the contractor according to the following details.

1) Contractor shall make early contact with University IT Services (through the Project Manager) to obtain the three−letter identifier and any other special requirements for each project. Example labels are available upon request.
2) A sample of the labeling shall be submitted to the University for approval prior to installation.

b. Mechanically printed, adhesive labels shall be used in all cases except for 66 blocks. Labels shall have a white background with black lettering.

3.3 LABELING

A. University Approved Labeling Format
1. All labeling shall be submitted to the Miami University IT Services for approval prior to installation.
2. Labeling shall be furnished and applied to all components of Division 27 in conformance with the following numbering formats:
a. A Three−digit identifier will be provided by The University for each project. The following examples, utilize the three−digit identifier and for Anderson Hall
b. TR (Telecommunications Room) Patch Panel: (intuitively AND004−AA−1 thru 48, AND004− A−B−1 thru 24 and AND004−A−B−1 thru 48 and so on.) 104.1.1 would be D1 (Data 1) on Outlet 104−1, 104.1.2, 104.1.3, 104.1.4, etc,
c. Outlet: AND104−1, AND004 (include D1, D2, D3 & D4 at each jack)

3.4 FINAL CLEANING

A. Contractor shall thoroughly clean all assemblies within all MCR and TR spaces before they are turned over to University IT Services for operation. Cleaning shall include, but not be limited to, all ladder tray, racks and wire managers (inside and out), copper and optical fiber panels (inside and out). Should the MCR or TR be completed prior to the balance of the floor space that it serves, racks, cabinets, and wall frames shall be covered with plastic sheeting to repel dust and other contaminants to which they will be subjected.

APPENDIX A

TBB/TEBC linear length m	TBB/TEBC size (AWG)
Less that 4 (13)	6
4 − 6 (14 − 20)	4
6 − 8 (21 − 26)	3
8 − 10 (27 − 33)	2
10 − 13 (34 − 41)	1
13 − 16 (42 − 52)	1ƒ0
16 − 20 (53 − 66)	2ƒ0
20 − 26 (67 − 84)	3ƒ0
26 − 32 (85 − 105)	4ƒ0
33 − 38 (106 − 125)	250 kcmil
38 − 46 (126 − 150)	300 kcmil
46 − 53 (151 − 175)	350 kcmil
53 − 76 (176 − 250)	500 kcmil
76 − 91 (251 − 300)	600 kcmil
Greater than 91 (301)	750 kcmil

Table 1

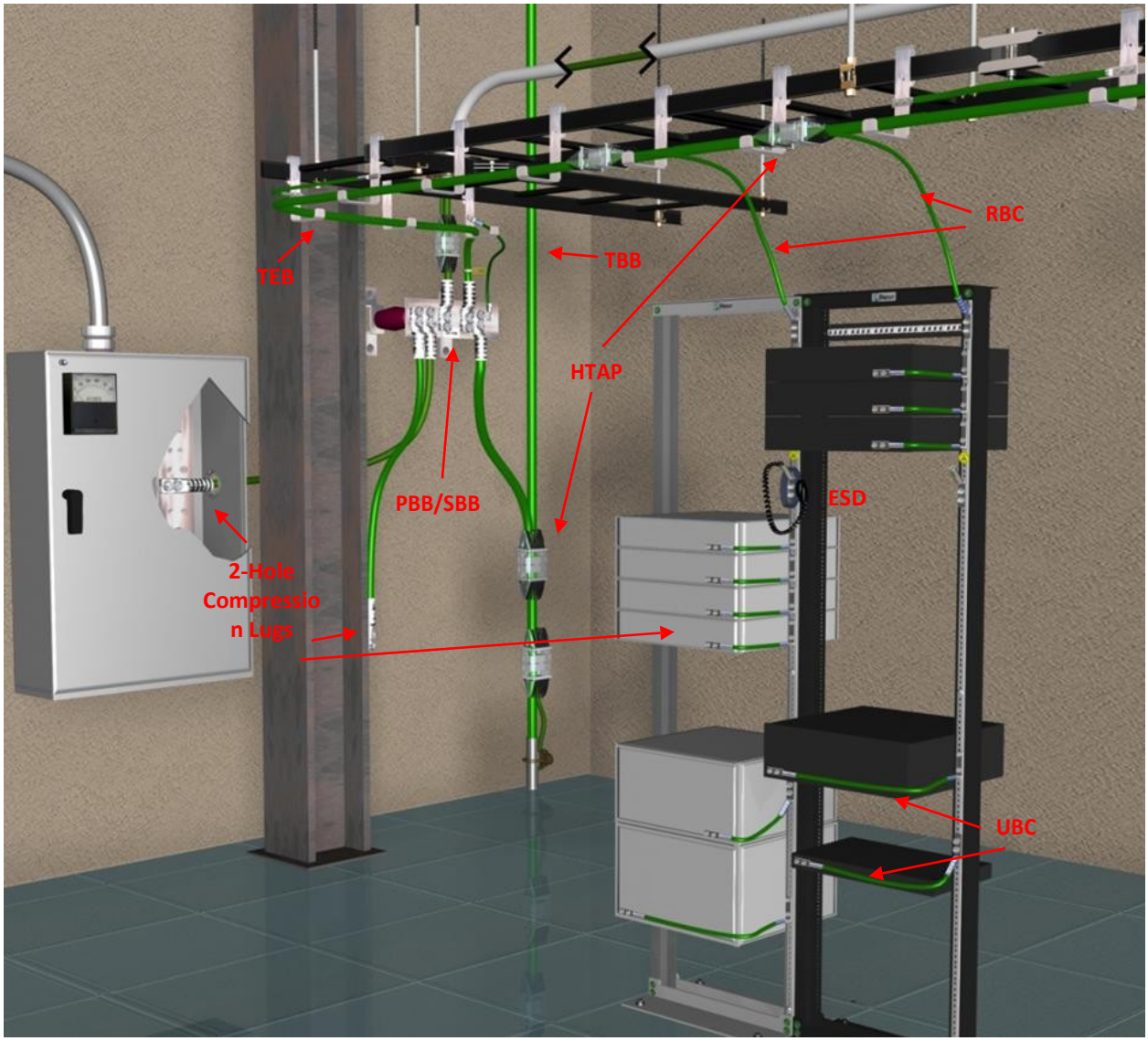

Figure 1 (grounding reference only)

APPENDIX B

Category	Manufacturer	Part Number	Description
Grounding/ Bonding	Panduit	GB2B0514TPI-1	1/4" X 2" X 24" Telecommunications Grounding Busbars.
	Panduit	GB4B0612TPI-1	1/4" x 4" x 12" Grounding Busbar.
	Panduit	HTWC2-2-1	Kit contains HTCT2-2-1 HTAP and CLRCVR2-1 clear cover, terminates code #2– #6 AWG STR/SOL Run and Tap 1 or flex #2 – #8 AWG Run and Tap 1, code or flex #8 – #14 AWG Tap 2 and Tap 3.
	Panduit	HTWC250-2-1	Kit contains HTCT250-2-1 HTAP and CLRCVR3-1 clear cover, terminates code 250 kcmil – #2 AWG Run or flex 4/0 – #2 AWG Run, code #2 – #6 AWG STR/SOL or flex #2 – #8 AWG Tap 1, code or flex #8 – #14 AWG Tap 2.
	Panduit	RGS134-1Y	Grounding strip; 78.65" (2m) length; .67" (17mm) width; .05" (1.27mm) thickness; provided with .16 oz. (5cc) of antioxidant, one grounding sticker and three each #12-24 x 1/2" and M6 x 12mm thread-forming screws.
	Panduit	RGRB19U	Grounding busbar; 19" (483mm) length; tin-plated; twenty holes arranged for flexibility in mounting with twenty #12-24 x 1/2" hex head screws installed; mounting hole sets have 5/8" (15.9mm) spacing; provided with two each #12-24 x 1/2", M6 x 12mm thread-forming screws, and two #12flat washers for mounting.
	Panduit	RGCBNJ660P22	#6 AWG (16mm²) jumper; 60" (1.52m) length; 45° bent lug on grounding strip side; provided with .16 oz. (5cc) of antioxidant, two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws and a copper compression HTAP* for connecting to the MCBN.
	Panduit	RGEJ624PFY	#6 AWG (16mm²) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws.

	Panduit	RGESD2-1	Two-hole ESD port with 5/8" hole spacing, provided with an ESD protection sticker, .16 oz. (5cc) of antioxidant, and two each #12-24 x 1/2" and M6 x 12mm thread-forming screws.
	Panduit	RGESDWS	Adjustable fabric ESD wrist strap with 6' coil cord, banana plug, 1 megohm resistor and 4mm snap.
	Panduit	RGTBSG-C	Green thread-forming bonding screw, #12-24 x 1/2", 100pk
	Panduit	RGTS	Thread-forming grounding screw, #12-24 x 1/2".
	Panduit	RGW-100-1Y	100 paint piercing bonding washers for 3/8" (M8) stud size; .875" (22.2mm) O.D.; provided with .16 oz. (5cc) of antioxidant.
	Panduit	ACG24K	#6 AWG (16mm²) jumper for armored cable diameter up to 0.84" (21.3mm); 24" (609.6mm) length; factory terminated on one end with LCC6 two-hole copper compression lug and the other end with grounding terminal; provided with two each #12-24 and M6 thread-forming screws and a black polypropylene terminal cover.
	Panduit	ACG24K-500	#6 AWG (16mm²) jumper for armored cable diameter 0.85" (21.3mm) to 1.03" (26.2mm); 24" (609.6mm) length; factory terminated on one end with LCC6 two-hole copper compression lug and the other end with grounding terminal; provided with two each #12-24 and M6 thread-forming screws and a black polypropylene terminal cover.
	Panduit	LCC-W Series	Two-hole compression connectors; long barrel, windowed
	Panduit	CGJ620UC	Front to back rail grounding jumper kit; two #6 AWG (16mm²) jumpers; factory terminated on both ends with 90° reverse bent lugs; Length 20" (.5M); for thru-hole rails.
	Arlington	EMT400	Insulated Bushings
	Open Sourced		Grounding Conductor, Stranded 6AWG w/ Green Insulation
Hangers/ Supports	Panduit	J-Pro Series	4" or 2" J- Hooks and accessories only
Identification	Brother	P-Touch	1/4" Black-on-White Label Tape for Patch Panel
	Brother	P-Touch	3/8" Black-on-White Label Tape for Faceplates

	Brady	311-292	ID Pro Label Tape for Cable Jacket
Firestopping Devices			
Communication Entrance Protection	Porta Systems	581 P225 GT	25-Pair Primary Protection Module w/ 66 Clip In/Out
Communication Racks /Frames	Panduit	R2P	Standard 19" EIA Aluminum 45RU 2-Post rack with hardware kit and paint piercing bonding kit, numbered up.
	CPI	48353-715	Open Frame Equipment Rack 7' x 19", Single Upright Two-Post
Communication Termination Blocks/Patch Panels	Emerson Network Power	R66M150X	50-Pair 66 Style Punch Down Block
	Emerson Network Power	R891	Stand-Off Bracket for 66 Style Block
	Panduit	CPP48FMWBLY	48-port flush mount patch panel supplied with rear mounted faceplates.
	Panduit	SRB19BLY	Strain relief bar extends 2" off the rack; supports, manages, and provides proper bend radius protection.
	Panduit	P110B1005R4WJY	Two 100-pair bases and jumper troughs pre-mounted to 19" rack mount panel with 5-pair connector kit included with five 5-pair connectors per row of 25 pairs.
Communication Cable Management /Ladder Rack	CPI	11729-X03	Double-Sided Vertical Cable Manager
	Panduit	CMPHH2	2RU Horizontal D-ring cable manager, D-rings on front only, 3" x 3" ring size.
	Panduit	SRB19MDBL	Strain relief multi-depth bar extends 7" off the rack, supports, manages, and provides proper bend radius protection. Ideal for use with Category 6A copper cabling installations.
	Panduit	CMW-KIT	Waterfall Kit
	Panduit	CMSRC2	Bend Manager
	Panduit	CWF-400	4" Conduit Waterfall Kit
	Homaco/ Ortronics-Legrand	TRC10-12	Ladder Rack, 12 inches Wide
	Homaco/ Ortronics-Legrand	TRC6-12	Ladder Rack, 12 inches Wide
	Homaco/ Ortronics-Legrand	P820147H	Corner Clamp

	Homaco/ Ortronics-Legrand	P128240H	Wall Angle Assembly
	Homaco/ Ortronics-Legrand	P139340H	Shelf Bracket
	Homaco/ Ortronics-Legrand	P4033472H	Straight Clamp Assembly
	Legrand/ Cablofil	09-2E72-0012-12	PW Ladder Tray 5" x 12" Mill Galv. Steel
	Legrand/ Cablofil	09-2E72-0012-18	PW Ladder Tray 5" x 18" Mill Galv. Steel
	Legrand/ Cablofil	50-5164-0006-12-02-J	Peaked Flanged PW Tray Cover 12" x 72"
	Legrand/ Cablofil	G-0215-13	Single Strut Bracket
	CPI	10250-706	Ladder Rack, 6 inches Wide
	CPI	10250-712	Ladder Rack, 12 inches Wide
	CPI	10250-X18	Ladder Rack, 18 inches Wide
	CPI	12100-712	Cable Runway Radius Drop, 12 inch
	CPI	12100-X18	Cable Runway Radius Drop, 18 inch
	CPI	10595-712	3" Channel Mounting Plate, 12 inch
	CPI	10595-X18	3" Channel Mounting Plate, 18 inch
	CPI	11421-712	Wall Mounting Angle, 12 inch
	CPI	1141-X18	Wall Mounting Angle, 18 inch
	CPI	10608-001	Vertical Wall Bracket
	CPI	11309-001	Cable Runway Foot
	CPI	11301-011	Butt Splice Kit
	CPI	11302-701	Junction Splice Kit
	CPI	11746-712	Triangular Support Bracket, 12 inch
	CPI	11746-X18	Triangular Support Bracket, 18 inch
	CPI	12594-X01???	Runway Enclosure Junction Kit ???
	CPI	12595-X01 ???	Runway Enclosure Junction Kit???
	CPI	10506-706	Runway Elevation Kit
	CPI	10595-712	Rack/Runway Mounting Plate
	CPI	11959-X15	Corner Bracket 15" W
	CPI	10596-706	Cable Runway Retaining Post
	CPI	13392-712	Cable Runway Pathway Divider
	CPI	10642-001	Protective End Cap
	CPI	10757-001	Protective End Cap
Communications Copper Backbone Cabling	Erico/Caddy	CAT600WM	Vertical Backbone Cable Support
	General Cable, CommScope, Superior-Essex	Anixter CMR-002524EAA though CMR-0040024EAA	Intrabuilding Category 3 Multi-pair ARMM Cabling

	General Cable, CommScope, Superior-Essex	Anixter E-002524DFC through E-090024DFC	Interbuilding OSP Cat3 Cabling
Communications Optical Fiber Backbone Cabling	Preformed		Armadillo Re-Enterable Closure
	3M		710 Series Splicing Components
	Grainger	3W517	OSP Pull Rope
	Corning	036EUC-T4100D20	Altos Loose Tube Gel-Free, Armored, 36-element Single Mode
	Corning	012EUC-T4100D20	Altos Loose Tube Gel-Free, Armored, 12-element Single Mode
	Corning	FAN-BT25-12	Fanout Kit, 12-element Units
	Corning	036H8F-61131-29	FREEDM ONE Unitized Tight Buffer Cable, I/O, 36F, Singlemode, CMR
	Corning	012E81-33131-24	MIC Tight Buffer Cable, 12F, Singlemode, CMR
	Corning	012E81-33131-A1	MIC Tight Buffer Cable, 12F, Singlemode, armored
	Corning	012T81-33180-24	MIC Tight Buffer Cable, 12F, 50um, OM3, CMR
	Corning	012T81-33190-A1	MIC Tight Buffer Cable, 12F, 50um, OM4, armored
	Corning	SX300/SMF28e	900µm Tight Buffered Fanout Cable, 12-element Multimode + 12-element Single Mode, OFNR
	Corning	SX300/SMF28e	900µm Tight Buffered Fanout Cable, 12-element Multimode + 12-element Single Mode, OFNP
	Corning	CCH-04U	72/288-F RACK-MT ENCLOSURE 19" 4U EMPTY - ACCEPTS 12 PANELS, CASSETTES OR MODULES
	Corning	CCH-BLNK	BLANK PANEL
	Corning	CCH-CS24-A9-P00QJ	CCH SPLICE CASSETTE 24 FIBER LC-DUP SX+ OM4 RIBBON SPLICING
	Corning	CCH-CS24-A9-P00RE	CCH SPLICE CASSETTE 24 FIBER LC-DUP OS2 900UM
	Corning	CCH-CS24-A9-P00TJ	CCH SPLICE CASSETTE 24 FIBER LC-DUP OM3 RIBBON
	Corning	CCH-CS24-E4-P00	CCH SPLICE CASSETTE OM3 LOADED PANEL & PIGTAILS, 24F LC-DUPLX V#CCH-CS24-E4-P00TE
	Corning	CCH-CS24-E4-P00QE	CCH SPLICE CASSETTE 24 FIBER LC-DUP SX+ OM4 SINGLE FIBER SPLICING
	Corning	CCH-CP12-A9	Optical Connector Panel w/ (6) Duplex LC, 8-8.3/125 Single Mode Ceramic
	Corning	CCH-CP12-E4	Optical Connector Panel w/ (6) Duplex LC, 50/125 Multimode Ceramic

	Corning	CCH-CS12-B3-P00RE	CCH SPLICE CASSETTE 12 FIBER LC/APC-DUP (OS2)
	Corning	SCF-8C28-02-F	Optical Splice Closure
	Corning	SCF-ST-077	Optical Splice Tray
Communication Horizontal Cabling	General Cable	7133901	Category 6 CMR, white
	General Cable	7131901	Category 6 CMP, white
	Belden	3612	Category 6 CMR, white
	Belden	3613	Category 6 CMP, white
	Belden	7931A	Category 6, Industrial, Harsh Environment, Black
	General	7133850	Copper cable, category 6A UTP, riser (CMR), 4-pair, conductors are 23 AWG with flame-retardant PE insulation, twisted in pairs, separated by an integrated pair divider, surrounded by a patent-pending Mosaic tape and protected by a flame-retardant PVC jacket, white.
	General	7132850	Copper cable, category 6A U/UTP, plenum (CMP), 4-pair, conductors are 23 AWG with FEP insulation, twisted in pairs, separated by an integrated pair divider, surrounded by a patent-pending Mosaic tape and protected by a flame-retardant PVC jacket, white.

Communication Faceplates/ Connectors	Panduit	CBEIWY	Single gang faceplate frame accepts up to two 1/2-size module inserts or three 1/3-size module inserts. Supplied with labels and label cover/screw covers, Off White.
	Panduit	CBEIW-2GY	Double gang faceplate frame which accepts up to four 1/2-size module inserts or six 1/3-size module inserts. Supplied with labels and label cover/screw covers, Off White.
	Panduit	CHSRE2IW-X	Two module space, 1/2-size, 30° sloped recessed insert accepts two Mini- Com® Modules, Off White.
	Panduit	CFFP4BL	Faceplate snaps into industry standard knockouts found on modular furniture. Accepts up to four Mini-Com® Modules. Black.
	Panduit	CBX1EI-A	Mini-Com® 1-port low profile surface mount box accepts a single Mini-Com® Module. Dimensions: 0.90"H x 1.03"W x 1.89"L (22.8mm x 26.3mm x 48.1mm), Electric Ivory.
	Panduit	CBX2EI-AY	Mini-Com® surface mount box accepts up to two Mini-Com® Modules. Includes built-in removable blank to add a second module. Dimensions: 1.06"H x 1.95"W x 3.65"L (27.0mm x 49.5mm x 92.7mm), Electric Ivory.
	Panduit	CHB2IW-X	1/2-size blank insert. Reserves space for future upgrades, Off White.
	Panduit	CF1064EIY	Module frame mounts behind standard 106 NEMA faceplates, accepts four Mini-Com® Modules, Electric Ivory.
	Randl Inc.	T-55017	5 SQUARE® Telecommunications Outlet Box
	Panduit	CHI2MWI-X	Adapter for use with Wiremold CM- ARA
	Panduit	CUFMB24BL	24-Port Consolidation Point Enclosure/Panel
	Panduit	CUFB48BL	48-Port Consolidation Point Enclosure/Panel
	Tyco Electronics	T-DUX-125, T-DUX- 100S, T DUX-100	Waterblocking Devices
	Tessco	12106OPOLY-WM-ODO	TERRAWAVE 12x10x6 Polycarbonate enclosure with solid door, locking latches, mounting flanges, mounting feet & outdoor MIMO Omni
	Wiremold	CM-ARA	Carrier for 5500 Wiremold Applications
	Panduit	CJ688TGWH	Category 6, RJ45, 8-position, 8-wire universal module, white.

	Panduit	CJ6X88TGIW	Category 6A, RJ45, 10 Gb/s, 8-position, 8-wire universal module, white.
	Panduit	CMBIW-X	Mini-Com® 1-port blank module, reserves space for future use, Off White, 10 pc.
	Panduit	MPI588T	8-position, 8-wire, UTP modular plug with bulkhead, for use with 24 AWG, Category 5e, shielded copper cable.
	Panduit	CMFSREIY	Module supplied with 75 ohm self-terminating F-type coupler, electric ivory.
	CommScope	2227V	RG6 Quad Shield Coax, White CMP
	CommScope	5740R	RG6 Quad Shield Coax, Black CMR
	CommScope	5940R	RG11 Quad Shield Coax, Non-Plenum
	ICM Corporation	RG-6WR	F-Connector for Coaxial Cable (2227V)
	ICM Corporation	RG-6NR	F-Connector for Coaxial Cable (5740R)
	Belden/ ICM Corporation	716SNS1P11HQ	F-Connector for RG11Q Coaxial Cable (5940R)

END OF SECTION

SECTION 27 4000

AUDIO/VIDEO SYSTEMS

This bid package requests a total package price for the build up and installation of audio-visual presentation systems. The systems will use state-of-the-art electronic equipment to allow the presenter(s) to make multimedia presentations in these classrooms. The systems are built based on the University's Standard Classroom design. The system will use audio and video derived from sources such as a resident classroom computer, bluray player, digital document camera, and other external devices (such as a laptop, computer, tablets, and phones).

1. Vendor will be responsible for the following:

1.1. Attend all weekly project meetings once this becomes appropriate, and coordinate the installation of A/V with all other trades. The vender is responsible and liable for any changes to electrical, ceiling, or wall changed in order to finish the install due to the lack of coordination.

1.2. Providing a completely operational ("turn-key") system that fulfills all the functions specified under System Specifications and the conceptual drawings included with this bid package. The equipment list and drawings are "NOT" intended to be used for final design/build. The vender is responsible to complete and include any additional hardware and engineering that is required to provide a complete and functional system.

1.3. Submitting proposed system design schematic, along with layouts and labels for connection panels, equipment rack layouts, and all equipment makes and models for approval prior to implementation. Vendor shall submit these documents at least ten (10) working days before approval is required, and remain available during this period to make such changes as may be required by the University. The intent is for the vendor and the University to establish a clear agreement as to the details of the system.

1.4. Providing and installing all equipment, cabling, connectors, plugs and jacks, programming, mounting, and security hardware, custom interface panels and plates, power cords, and outlet strips, and other items as required to meet this objective, regardless of whether or not named specifically herein. All such components shall be such design and qualities as are appropriately and satisfactorily used in commercial, industrial, and higher education institutions. All equipment with front panel options shall be provided with local or front panel controls if available.

1.5. Any custom programming. All custom programming along with source code shall be turned over to the University. All code becomes property of Miami University.

1.6. Site supervision by a single designated coordinator over the course of installation, who shall be the vendor's primary contact with the University and available by phone during working hours.

1.7. Compliance with good practices and standards for the installation and wiring of audio-visual systems, as exemplified in ICIA Installation School.

1.8. Shipping arrangements and costs for, and receipt, custody, and security of, all equipment and material until system acceptance has been completed.

1.9. The connection of the system to the power and communications cables or outlets provided in the room by the University. This may include telephone, data, alarm, CATV, and auxiliary wiring.

1.10. Attaching the projector mount to the ceiling structure as required. Coordinate with the electrician for final placement of the electrical outlet in the ceiling and the location of the 1 ¼" conduit penetration.
1.11. Any additional blocking required for securing and mounting displays, speakers or any other A/V equipment to a wall. The vender may contract with the general contractor to have this provided for them if so desired. This must be coordinated during the weekly project meetings.
1.12. Labeling of each panel-mounted connector with familiar terms for use on the front side, and unique designation as used on the as-built system drawing on its backside. Labels must be either engraved into the panel, or engraved in plastic stick on labels. Tape labels or label machine labels are not acceptable.
1.13. The adjustment, performance checks, and documentation of all functions.
1.14. Documentation: A separate binder for each system type, labeled with building and room number, and containing: As-built system schematics with unique designations for each cable, matching the labels provided on the cables and connection panels.
1.15. Operating manuals for each item of equipment.
1.16. List of equipment settings required for proper operation (such as equalization, gain, and delay in sound amplification system).
1.17. An inventory list of name, make, model and serial number, MAC address, and Jack ID's for each item of equipment in the room.
1.18. A signed statement of warranty bearing the coverage dates (see system warranty section).
1.19. Two copies of a CD-ROM containing all of the above material. As-built drawings shall be provided in PDF format in addition to AutoCad, Visio, or other standard program used in their creation. Software programs and any passwords that may be necessary to access, edit, or load control code into devices shall be provided along with the source and complied code. Where adjustments are made through software programs, the adjusted settings and software necessary to load them shall be included. The only exception to this requirement shall be for materials which a manufacturer does not make available in electronic format.
1.20. Training on the operation and maintenance of the system to designated University support staff.

2. System Specifications

2.1. Functionality (reference attached drawings: AV System Design; Additional Wiring Diagram; Touch Screen Layout, Plate Layouts, Teacher Station pictures).
2.2. Provide sufficient brightness, image clarity and size, and sound level and clarity, to enable students with mild hearing or visual loss to perceive program material accurately.

3. Preferred Products & Specifications

3.1. The following list names acceptable models of equipment, which at this date are preferred by the Miami University Electronic Classroom Planning Services for consistency and ease of support. Substitutions for discontinued items must be of the same manufacturer and be the current replacement for that model.

Item	Manufacturer	Model
Data Projector	Panasonic	As Required

Document Camera	Lumens	DC-193
Control System	Crestron	Control Processors and Touch Screens
Instructor Workstation	Case Crafters	MU-Series Custom Cabinet
Matrix Switcher	Extron	Switchers, Matrix Switcher

3.2. The vendor is expected to be pro-active in advising Miami University Electronic Classroom Planning Services of improvements in relevant AV technology and pricing in a timely manner, and to provide demonstration samples for testing and evaluation in actual use.
3.3. Equipment shall be of current design and consist of standard products from established manufacturers, carrying valid manufacturer's standard USA warranties.
3.4. All items must be new. Latest versions of a product type are generally preferred. Used, including demonstrator equipment is unacceptable.
3.5. The smart controls shall be designed to provide optimum usability for all controllable equipment. They shall imitate the design and functionality of the touch-screen type user interface for the University's existing systems with such improvements as may be required by this document or specified during the final design approval process prior to the implementation.

4. The University will provide:

4.1. All standard conduits or other clear cable paths for signal cables (conduit will be provided in walls, but may be stubbed at the ceiling on non-plenum areas.)
4.2. AC power to instructor workstation and projector location.
4.3. Projector Stem in proper location for mounting the projector.
4.4. Resident Classroom computer and monitor
4.5. Room lighting.
4.6. A person designated as primary point of contact for the project; however, the vendor may be required to interface directly with other trades and University Staff to coordinate work and resolve problems.

5. Schedule Requirements and System Acceptance

5.1. Vendors must adhere to timetables for installation and completion of electronic classroom systems. Timetables will be mutually agreed upon as part of the award for this project. Failure to achieve system acceptance by the deadline specified may result in assessment of liquidated damages as set forth in the Contract Documents. Vendor will perform and document systematic comprehensive testing that will be performed before final acceptance of installed systems. The purposes of these tests are to demonstrate that systems meet all performance, installation, and training specifications as set forth in the Contract Documents to the satisfaction of the Miami University representatives.
5.2. System acceptance will be granted when the vendor has demonstrated and documented compliance with all requirements of this contract, unless the University issues a specific waiver in writing.

System Warranty

6.1. The vendor shall include a statement of warranty on the entire system, which shall begin on the date of system acceptance and end no earlier than one year later. These dates shall be recorded as the start of the system warranty at the completion of system acceptance.
6.2. The vendor shall provide all equipment, material, labor, software and travel at no charge to the University during the warranty period for any and all failures of any kind, except as may result from University abuses. Any changes in programming that may be required as a result of vendor's substitution of equipment in fulfillment of the warranty will be the obligation of the vendor.

7. Attachments

8. Omitted

9. Service Offering

The University usually has existing on-site systems support teams that provide an initial rapid response to inoperative installed systems. Their purpose is to solve minor problems on site (such as open circuit breakers burned out bulbs), and to swap out equipment when necessary. They do not generally repair electronic equipment.
Service requirements regarding your products/product lines and labor are as follows:

9.1. Service guarantee that someone will respond by phone with 2 hours from the time of initial contact. Must be able to provide an on site technician for emergency repairs within 24 hours from the time of initial troubleshooting call. The determination of an emergency call or not will be the responsibility of the University representative.
9.2. Technician and user training provided to University personnel
9.3. Warranties: advise of all standard warranty coverage and of any improvements you propose to extend to the standards. Include service level guarantees.
9.4. Tools: vendors and any subcontractors shall furnish at their own cost all tools and expendable supplies necessary to complete work and shall be responsible for their security.

10. Omitted

11. Vendor Credentials

11.1. The vendor must be able to demonstrate an established, successful track record of past performance in providing products and services closely related to the requirements and scale specified in technical specifications and other Contract Documents. In addition to the information contained in the RBI additional information is required, as set forth below, to demonstrate your company's background and experience in supplying and maintaining audio-visual systems to colleges and universities.

12. Staff Experience

12.1. Supply resumes or background and the level of experience of all individuals who will be involved with this project. Include a description of the individual's current responsibilities for this project including, but not limited to, the following positions:
  12.1.1. Sales representative/account manager.
  12.1.2. Corporate executive who has the authority to negotiate for and bind the company contractually when the bid is awarded.
  12.1.3. Marketing personnel/project managers who would be assigned to this project.
  12.1.4. Implementation Project Manager who would be assigned to this project.
  12.1.5. System designer must have ICIA CTS certification (name and certification must be supplied).
  12.1.6. System programmer must have Crestron Programming certification.
  12.1.7. Lead system installer must have ICIA CTS certification.

12.2. Such special qualifications as may be required to install, align, or service the provided equipment in order to maintain manufacturer's warranties.

12.3. Alternative qualifications will be considered if submitted with bid, but the acceptability of the skill sets as being capable of performing the technical services required for this project will be determined solely by the University.

12.4. Other requirement: Location and response time for service calls as set forth in 12.5.

12.5. Vendor must have qualified personnel who can and will respond on site within four hours of a call for urgent service. Vendors located more than two hundred road miles from the University's campus are deemed unable to meet this requirement and thus ineligible for award.

12.6. Qualified means that personnel have the requisite training, experience, and support to be able to determine on the first visit what item of equipment or wiring is responsible for a malfunction, and to remove, adjust, install, or substitute other similar equipment or wiring to restore service.

13. Request for References

Reference: Responsible Bidder Information Sheet provide in this package.

By providing this information you are granting the University the right to contact any and all references listed to make inquiries as to the type, nature, length, and quality of products and services rendered by your firm. Furthermore, the University reserves the right to factor that information into our bid evaluation process.

14. Method of Evaluation

In determining whether the apparent low bidder is deemed a "responsible" bidder within the meaning of ORC Chapter 153 and the Contract Documents, the information submitted pursuant to sections 11, 12 and 13 above will be carefully examined to assure that the Bidder possesses the requisite level of expertise to perform the highly technical Work required for this project, with such criteria to include, without limitation, the firm's qualifications, past experience with similar projects, and proximity to the University.

15. University Mark(s) Promotions Notice:

The contractor covenants and agrees that unless the University Director of Licensing first gives prior written consent, the contractor shall not (1) use the words “Miami University” (whether alone or in combination with other words), (2) display or otherwise use the name, emblem or logo (or any similar name, emblem, or logo) of any department, or other component constituent or affiliate of the University or (3) otherwise refer to the University or any department, or other component or affiliate of the University, whether in or on any sign advertisement (including any newspaper, television, or radio advertisement), commercial announcement, circular, flier, or other publication or employee uniform.

16. Equipment Specifications:

The conveyance for the Data/Voice, A/V, and electric will be provided in each classroom by the University. It will be the responsibility of the A/V contractor to provide the appropriate cover plates for each of the types. Most of the cover plates have been specified on the equipment list and included drawings. The conveyance and electric will be provided by the University. Any additional conveyance required by the A/V contractor will be the responsibility of the A/V contractor. It will be the responsibility of the A/V contractor to mount the projector to the provided pipe stem with the appropriate mounting hardware. It will be the responsibility of the A/V contractor to pull and terminate all cables required to provide a fully functioning system. Exposed cables above the ceiling must be approved by the University. All cables need to be plenum and securely attached above the ceiling with wire loops or appropriate hangers. All other cables must be in cable tray or conduit.

END OF SECTION

SECTION 28 31 11

ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes fire alarm systems, including manual stations, automatic detectors, signal equipment, controls, and devices.

B. The fire alarm specifications and drawings define the intent of the fire alarm system to be provided. Provide delegated design and submittal for complete fire alarm system, signed and sealed by the NICET certified fire alarm designer in compliance with all governing laws, rules and regulations. Nothing in the specifications or drawings shall be deemed as authority to violate any governing code.

C. Provide new fire alarm devices in the area of work as indicated in construction document. Integrate new fire alarm devices to existing fire alarm system.

1.3 SYSTEM DESCRIPTION

A. General: Complete, non-coded, addressable, fire detection and alarm system with manual and automatic alarm initiation, addressable smoke detectors, automatic alarm verification for alarms initiated by certain smoke detector zones as indicated, and Transient Voltage Surge Suppression (TVSS) for all 120 VAC power circuits at each fire alarm equipment connected to 120 VAC power, and TVSS at each end of all low voltage circuits which run between and among buildings.

B. System Capacity: 632 intelligent addressable detectors and 632 addressable modules and expandable through addition of LCM and LDM loop cards.

C. Signal Transmission: Multiplex signal transmission dedicated to fire alarm service only.

D. Alarm Indication: By synchronized sounding of voice alarm messages and tone signals on loudspeakers and synchronized flashing of strobes. Horn tone signals shall be synchronized, utilizing the ANSI S3.41 emergency evacuation signal consisting of a three-pulse on-off-on repeating signal.

E. System connections for alarm-initiation and alarm-indicating circuits: Class B wiring.

F. Functional Description: The following are required system functions and operating features:

1. Priority of Signals: Accomplish automatic response functions by the first zone initiated. Alarm functions resulting from initiation by the first zone shall not be altered by subsequent alarms. Alarm signals shall have the highest priority; supervisory and trouble signals have second and third-level priority, respectively. Signals of a higher-level priority shall take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all alarm signals regardless of priority or order received.
2. Non-interfering: Zone, power, wire, and supervise the system so a signal on one device does not prevent the receipt of signals from any other device. All zones shall be capable of being reset manually from the FACP after the initiating device or devices are restored to normal at the initiating device.
3. Programming: All FACP programming and operational features shall be stored in non-volatile memory. Systems that require the use of batteries or battery backup for the program storage are not acceptable. Provide programming of custom messages for each alarm initiation device, and each trouble and supervisory device. Custom messages are to be reviewed and approved by Owner.
4. Signal Initiation: The manual or automatic operation of an alarm, supervisory or trouble condition shall cause the FACP to transmit an appropriate signal including:
    a. General alarm.
    b. Fire suppression system operation alarm.
    c. Smoke detector alarm.
    d. Valve tamper supervisory.
    e. Door release.
    f. Elevator recall.
    g. Elevator shutdown.
    h. System trouble.
    i. Fan shutdown.
    j. Smoke damper control.

G. Transmission to Remote Central Station: Automatically send alarm, supervisory, and trouble signals to Miami University Police Department (MUPD) via Keltron system.

H. Silencing at FACP: Provide capability for acknowledgment of alarm, supervisory, trouble, and other specified signals at the FACP and the capability to silence the local audible signal and provide a visual silenced indicator. Subsequent zone alarms shall cause the audible signal to sound again until silenced in turn by switch operation. Restoration to normal of alarm, supervisory, and trouble conditions shall extinguish the associated visual indicator and cause the audible signal to sound again until the restoration is acknowledged by switch operation.

I. Loss of primary power at the FACP shall sound a trouble signal at the FACP and the annunciator. A visual indicator shall illuminate at both locations when the system is operating on an alternate power supply.

J. Annunciation: Manual and automatic operation of alarm, trouble and supervisory signals shall be annunciated in plain English text utilizing a LCD display at the FACP and at the annunciator, indicating the location and type device. Transmit all alarm and supervisory signals to the remote central station and send the appropriate information to the system printer.

K. General Alarm: A system general alarm includes:
   1. Indicating the general alarm condition and identifying the device that is the source of the alarm at the FACP and the annunciators.
   2. Initiating audible and visible alarm signals throughout the building.
   3. Initiating automatic recall operation of elevators. This shall occur only from smoke detectors located in the elevator lobbies, the machine room and the hoistway. Actuation of the elevator lobby smoke detector at the designated level (main egress floor) shall signal the machine room with a dedicated signal. Actuation of a lobby smoke detector at any other floor elevator lobby shall send a separate signal to the elevator machine room. Actuation of a hoistway, pit or machine room smoke detector shall send a third dedicated signal to the machine room. Actuation of any heat or smoke detector at the top of the hoistway or in the pit or in the machine room shall send a fourth signal to the elevator machine room for elevator cab flashing signal. Heat detectors, when provided, shall not initiate this function.
      a. Elevator lobby, hoistway, and machine room smoke detectors shall be monitored by an alarm verification zone. If not allowed by the fire or elevator authority, then a minimum of two cross zoned detectors must be used for this purpose in each lobby, shaft and machine room (include a second smoke detector within the space to accomplish this requirements if alarm verification is rejected by the AHJ).

   4. Operation of a heat detector in the elevator hoistway, pit, or machine room shall cause the power to the related elevators to shut-down via the control methodology and time delays (if any) required by the AHJ. Operation of any of these detectors shall signal the fire suppression system and activate the appropriate response. Coordinate elevator shut-down requirements with elevator contractor.
   5. Closing fire and smoke doors normally held open by electrically operated door holders.
   6. Stopping supply and return fans when their duct detectors are actuated.
   7. Closing smoke dampers.

L. A general alarm shall be initiated by the following conditions:
   1. Manual pull station alarm operation.
   2. Water-flow alarm switch operation.
   3. Initiation of smoke detectors which do not require alarm verification.
   4. Priority 1 alarm condition.

M. Initiation of smoke detectors which require alarm verification shall cause the following:
   1. Audible and visible indication of an alarm verification signal at the FACP.
   2. Activation of a listed and approved "alarm verification" sequence at the FACP and the detector.
   3. General alarm initiation if the alarm is verified.
   4. FACP indication cancellation and system reset if the alarm is not verified.

N. Sprinkler valve tamper switch operation shall initiate the following:
   1. A supervisory audible and visible valve tamper signal indication at FACP and annunciators.

O. Closing of smoke dampers upon shut-down of air handling unit.

P. Remote Detector Sensitivity Adjustment: Manipulation of controls at the FACP shall allow the selection of specific addressable smoke detectors for adjustment, display of their current status and sensitivity settings, and control of changes in those settings. The same controls can be used to program repetitive, scheduled, automated changes in sensitivity of specific detectors. The system printer shall record sensitivity adjustments and sensitivity adjustment schedule changes. Prior to the start of detector sensitivity adjustment, the manufacturer and contractor shall meet with Miami University to coordinate smoke detector sensitivity level.

Q. Recording of Events: Record all alarm, supervisory, and trouble events by means of system printer. Printouts shall be by zone, device, and type of signal (alarm, supervisory, or trouble). Printout shall include date and time of the occurrence, and shall differentiate alarm signals from all other printed indications. System reset shall also be printed and include the same information concerning device, location, date, and time. It shall be possible to initiate the printout of a list of existing alarm, supervisory, and trouble conditions in the system.
   1. Permissible Signal Time Elapse: The maximum permissible elapsed time between the actuation of any fire alarm or fire-detection system alarm-initiating device and its indication at the FACP shall be ten seconds.
   2. Independent System Monitoring: Supervise each independent smoke detection system, duct detector, and elevator smoke detection system for both normal operation and trouble.
   3. Circuit Supervision: Indicate circuit faults by means of both a zone and a trouble signal at the FACP. Provide a distinctive indicating audible tone and a visual indication.

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
   1. Product data for system components: Include dimensioned plans and elevations showing minimum clearances and installed features and devices. Include list of materials and Underwriter's Laboratories listing data.
   2. Wiring diagrams from manufacturer differentiating between factory- and field-installed wiring: Include diagrams for equipment and for system with all terminals and interconnections identified, including power connections and interface to fire safety control functions. Indicate components for both field and factory wiring. Include conductor type and sizes.
   3. Battery and voltage drop calculations.
   4. System operation description covering this specific Project including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
   5. Operating instructions for mounting at the FACP.
   6. Operation and maintenance data for inclusion in Operating and Maintenance Manual specified in Division 1: Include data for each type product, including all features and operating sequences, both automatic and manual. Provide riser diagram of system showing locations and addresses of fire alarm devices. Include recommendations for spare parts to be stocked at the site. Provide the names, addresses, and telephone numbers of service organizations that carry stock of repair parts for the system to be furnished.

7. Warranty: Two years from the point of formal acceptance of the system by the University. Provide two full person days, minimum 16 hours, of on-site support for the system during warranty.

B. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of annotated Contract Drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, submit them for review. Make resubmissions if required to make clarifications or revisions to obtain approval.

C. Record of field tests of system.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A factory-authorized Installer is to perform the Work of this Section.

B. Compliance with Local Requirements: Comply with all applicable building codes, local ordinances, and regulations, and the requirements of the authority having jurisdiction.

C. Comply with NFPA 72 National Fire Alarm Code.

D. FM Compliance: Provide fire alarm systems and components that are FM-approved.

E. Single-Source Responsibility: Obtain fire alarm components from a single source that assumes responsibility for compatibility for system components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products as manufactured by Siemens, XLS series.

2.2 MANUAL PULL STATIONS

A. Description: Addressable, double-action type, fabricated of metal or plastic, and finished in red with molded, raised-letter operating instructions of contrasting color. Stations requiring the breaking of a glass panel are not acceptable. Stations requiring the breaking of a concealed glass rod may be provided.

B. Station Reset: Key or wrench-operated, double-pole, double-throw, switch-rated for the voltage and current at which it operates. Stations have screw terminals for connections.

2.3 SMOKE DETECTORS

A. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:
1. Factory Nameplate: Serial number and type identification.

2. Operating Voltage: 24-V D.C. nominal.
3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
4. Plug-In Arrangement: Detector and associated encapsulated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. The plug connection requires no springs for secure mounting and contact maintenance. Terminals in the fixed base accept building wiring.
5. Visual Indicator: Connected to indicate detector has operated.
6. Addressability: Detectors shall include a communication transmitter and receiver having a unique identification and capability for status reporting to the FACP.
7. Remote Controllability: Individually monitor detectors at the FACP for calibration, sensitivity, and alarm condition, and individually adjust for sensitivity from the FACP.

B. Photoelectric Smoke Detectors: Include the following features and characteristics:
1. Detector Sensitivity: Between 2.5- and 3.5-percent-per-foot smoke obscuration when tested according to UL 268.
2. Sensor: An infrared detector light source with matching silicon cell receiver.

C. Duct Smoke Detector: Photoelectric-type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied.

2.4 ALARM-INDICATING DEVICES

A. General: Equip alarm-indicating devices for mounting as indicated. Provide terminal blocks for system connections.

B. Addressable Interface Units: Arrange to monitor one system components that is not otherwise equipped for multiplex communication. The unit shall transmit identification and status to the FACP using a communication transmitter and receiver with unique identification and capability for status reporting to the FACP. Units that support more than one system component are not acceptable.

C. Visual Alarm Devices: Electronic, xenon flashtube type, designed for operation from 20 to 24 volts DC. Power connections shall be by means of a terminal block. Device shall comply with ADA requirements and be listed to UL 1971 and marked as such. Flash rate shall not exceed two per second. Light output shall be rated at a minimum intensity of 15/75 candelas per UL 1971 over the entire design voltage range, or as indicated on the drawings, whichever is greater. A designation of 75, in lieu of 15/75, indicates a UL 1971 rating of 75 candelas, which is different than the UL 1971 dual-rated 15/75 candelas. Mount lenses on an aluminum or Noryl faceplate. The word "FIRE" is to be marked in minimum 1-inch-high letters on the lens. Units shall have synchronization capability for uniform flashing of visual alarm units.
1. Color: White

D. Combination audio-visual devices shall consist of factory-combined audible and visual alarm units in a single mounting assembly. Each audible and visual component shall meet the same requirements indicated for separate fire alarm speakers and visual alarm devices indicated above and below.

2.5 LOUDSPEAKERS

A. Voice/Tone Speakers: Comply with UL 1480, "Speakers for Fire Protective Signaling." Use 25-volt system.

B. Speakers: Unit to have a frequency response of 400 to 4000 Hz; equipped with a multiple tap, varnish-impregnated, sealed, matching transformer. Match transformer tap range and speaker power rating to the acoustical environment of the speaker location. Provide speakers with ¼, ½, 1 and 2 watt tap settings providing 81, 84, 87 and 90 dB respectively at 10 feet. Set at ¼ watt except where higher taps are required for required dB audibility level and except where noted to have higher settings. Provide a white perforated grilled faceplate. Mount entire assembly in a steel back box, flush mounted unless otherwise indicated. Size amplifier(s) for actual wattage used plus a minimum of 50% spare capacity.

1. Re-Entrant Units: To be used outdoors or where noted, with adjustable mounting bracket, weatherproof enclosure, 5 watts with built-in amplifier and 1.25, 2.5 and 5 watt taps, proving 110, 113 and 116 dB respectively at 4 feet on axis, 300 to 10,000 Hz frequency response, 110 degree dispersion, similar to Wheelock SA-H5-B, or approved equal.
2. Color: White

2.6 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall mounting and are complete with matching door plate. Electromagnet operates from a 24 volt ac circuit provided from the fire alarm system, and shall require no more than 3 watts to develop 25 lbs. holding force.

B. Material and Finish: Stainless steel.

2.7 FIRE ALARM CONTROL PANEL (FACP)

A. General: Comply with UL 864, "Control Units for Fire-Protective Signaling Systems."

B. Cabinet: Lockable steel enclosure. Arrange panel so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control panel, provide exactly matching modular unit enclosures. Accommodate all components and allow ample gutter space for interconnection of panels as well as field wiring. Identify each enclosure by an engraved, red-laminated, phenolic resin nameplate. Lettering on the enclosure nameplate shall not be less than 1 inch high. Identify individual components and modules within the cabinets with permanent labels. Where multiple cabinets are required, the cabinets shall be the same size, type, and keyed alike.

C. Systems: Alarm and supervisory systems are to be separate and independent in the FACP. The alarm-initiating zone boards in the FACP consist of plug-in cards. Construction requiring removal of field wiring for module replacement is not acceptable.

D. Power Supplies: Power supplies for 24 volt DC shall be filtered and regulated. Power supplies and fusing shall be sized to operate properly under normal and peak device currents.

E. Control Modules: Types and capacities required to perform all functions of the fire alarm systems. Local, visible, and audible signals notify of alarm, supervisory, and trouble conditions. Each type of audible alarm has a distinctly different sound.

F. Digital Alarm Communicator / Transmitter (DACT) shall be provided for transmission of alarm, trouble and supervisory signals to University Police Department. DACT shall be UL listed and compatible with the central station service to be used.

G. Resetting: Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm, supervisory or trouble condition still exists.

H. Alphanumeric Display and System Controls: Arrange to provide the basic interface between human operator at FACP and addressable system components, including annunciation, supervision, and control. A display with a minimum of 80 characters displays alarm, supervisory, and component status messages and indicates control commands to be entered into the system for control of smoke detector sensitivity and other parameters. Arrange keypad for use in entering and executing control commands.

I. Voice Alarm: An emergency communication system, integral with the FACP, shall include central voice alarm system components complete with microphones, pre-amplifiers, amplifiers, audio source unit, and tone generators. Features include:
   1. Amplifiers: comply with UL 1711, "Amplifiers for Fire Protective Signaling Systems." Size for actual wattage used plus 50% spare. Select for 25 volt system.
   2. Two alarm channels shall permit simultaneous transmission of different announcements to different zones or floors automatically or by use of the central control microphone.
   3. All announcements shall be made over dedicated, supervised communication lines.

J. Instructions: Printed or typewritten instruction card mounted behind a lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a location observable from the FACP. Include interpretation and appropriate response for displays and signals, and briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.8 ANNUNCIATOR

A. Provide flush steel cabinet with keyed lockable door. Keyed alike to match FACP enclosure keys.

B. Power from the fire alarm control panel.

C. Provide power available light, alarm light, supervisory light and trouble light and test switch.

D. All alarm, supervisory and trouble conditions shall annunciate at the remote annunciator.

E. Provide an LCD display with language for each condition to match the control panel.

F. Locate as shown on the Drawings. Coordinate final location with City of Oxford Fire Marshal.

G. Provide microphone for manual anouncements.

2.9 EMERGENCY POWER SUPPLY

A. General: Components include valve-regulated, recombinant lead acid battery, charger, and an automatic transfer switch. Battery nominal life expectancy is 10 years minimum.

B. Battery capacity adequate to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. At the end of this period, the battery has sufficient capacity to operate the system, including alarm-indicating devices in either alarm or supervisory mode for a period of 15-minutes. For Voice Alarm communications service, the secondary power supply shall be capable of operating the system for a period of 15-minutes at maximum load.

C. Magnetic door holders are not to be served by emergency power. Magnetic door holders are released when normal power fails.

D. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Provide capacity for 150 percent of the connected system load while maintaining the batteries at full charge. In the event batteries are fully discharged, the charger recharges them fully within four hours. Charger output is supervised as part of system power supply supervision.

E. Unit shall automatically transfer the load to the battery without loss of signals or status indications when normal power fails.

2.10 TAGS

A. Tags For Identifying Tested Components: Comply with NFPA 72H.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install system according to NFPA Standards referenced in Parts 1 and 2 of this Section.

B. Fire Alarm Power Supply Disconnect: Provide lock on circuit breaker devices that are UL listed for use with the specific circuit breaker. Clearly mark the corresponding circuits on the panel board directory as "FIRE ALARM CONTROL CIRCUIT."

3.2 EQUIPMENT INSTALLATION

A. Protection from construction debris. Do not install detector heads, pull stations, fire alarm annunciators and signaling appliances before all dust producing construction in the area has ceased. Protective bags may be installed over said equipment if it is not possible to delay the equipment installation as herein stated. Remove protective bags after system is tested and accepted.

B. Install all devices including smoke and heat detectors, manual stations, control or monitor modules, notification appliances, etc., on a metal back box whether conduit is specified to be used or not.

C. Manual Pull Stations: Mount semi-flush in recessed back boxes with operating handles at ADA required mounting height.

D. Water-Flow Detectors and Valve Supervisory Switches: Connect for each sprinkler valve station required to be supervised.

E. Smoke Detectors: Install ceiling mounted smoke detectors where shown on the drawings but not less than 4 inches from a sidewall to the near edge. Where wall mounted, install smoke detectors at least 4 inches but not more than 12 inches below the ceiling. For exposed solid joist construction, mount detectors on the bottoms of the joists. On smooth ceilings, install detectors not over 30 feet apart in any direction. Install detectors no closer than 5 feet from air registers.

F. Install a smoke detector at the fire alarm panel location locations whether or not these are shown on the drawings.

G. All detectors are to be accessible. Particular attention is to be paid to locating duct mounted smoke detectors.

H. Heat detectors at the top of elevator shafts and in pits shall be located within 2 feet of each sprinkler head and shall have a 135 degree F rating maximum.

I. Audible Alarm-Indicating Devices: Install at mounting heights indicated on drawings. Install bells and horns on flush-mounted back boxes with the device operating mechanism concealed behind a grille or as indicated. Combine audible and visual alarms at the same location into a single unit.

J. Visual Alarm-Indicating Devices: Install at mounting heights indicated on drawings.

K. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.

L. Fire Alarm Control Panel (FACP): Surface mount with top of cabinet(s) not more than 6 feet above the finished floor.

M. Annunciator: Arrange as indicated, with the top of the panel no more than 6 feet above the finished floor.

N. System Programming: Provide programming of system and devices in accordance with this specific installation and programming of custom messages for each alarm initiating device and trouble condition. Custom messages are to be as indicated by owner.

3.3 WIRING INSTALLATION

A. Wiring Method: Where wiring is installed in accessible locations (above accessible ceilings), open plenum rated cabling may be used in the ceiling cavity . Cables shall be properly supported with dedicated J-hooks or bridal rings supporting fire alarm cabling only. Should bridal rings be used, each ring must include a cable saddle. Exposed cables will not be accepted. In spaces without ceilings, the fire alarm cabling shall be installed in conduit leading to an accessible ceiling cavity. Cable supports and cabling above the ceiling shall be placed to allow access for maintenance, but shall be placed to be protected from damage during maintenance of other systems. Where wiring will not be accessible it shall be installed in EMT conduit. Where wiring cannot be concealed in renovated spaces it shall be installed in surface metal raceway (review proposed surface raceway routing with the project architect and University's Project Manager prior to rough-in). Junction boxes shall be painted red.

B. Wiring Within Enclosures: Install conductors parallel with or at right angles to the sides and back of the enclosure. Bundle, lace, and train the conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the wiring diagrams of the system. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. Cable Taps: Use numbered terminal strips in junction, pull or outlet boxes, cabinets, or equipment enclosures where any circuit tap is made.

D. System Wiring: For the low-voltage portion of the fire alarm system, install minimum No. 16 AWG copper conductors for initiation devices and minimum #14 AWG copper conductors for notification , power supply and miscellaneous applications. Low voltage portion of wiring may be installed without conduit within crawl space or in the attic. Take voltage drop into account and increase size of wires where required. For line-voltage wiring, install No. 12 AWG size with insulation rated 75 deg C minimum.

E. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuits wiring and a different color code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visual alarm-indicating devices. Paint fire alarm system junction boxes and covers red. Provide the FACP with a legend of each unique wire color used identifying its service as noted above.

F. Wiring to telephone system: Provide necessary wiring from the FACP to the building telephone system and tag the telephone wiring as "Fire Alarm Communications" at all exposed locations and punch downs.

3.4 GROUNDING

A. Ground all equipment enclosures and conductor and cable shields.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

B. Pretesting: Upon completing installation of the system, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results. Pre-acceptance testing of the entire fire alarm system must be completed in the presence of the University Fire Marshal and University Project Manager prior to the Contractor requesting final inspection by the State Fire Marshal's Office. There are no exceptions to this requirement.

C. Report of Pretesting: After pretesting is complete, provide a letter on Contractor's letterhead certifying the installation is complete and fully operable, including the names and titles of the witnesses to the preliminary tests.

D. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.

E. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72. Minimum required tests are as follows:
   1. Verify the absence of unwanted voltages between circuit conductors and ground.
   2. Megger test all conductors other than those intentionally and permanently grounded with electronic components disconnected. Test for resistance to ground. Report readings less than 1-megohm for evaluation.
   3. Test all conductors for short circuits utilizing an insulation-testing device.
   4. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on the record drawings.
   5. Verify the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
   6. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of the initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
   7. Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.
   8. Test the system for all specified functions according to the manufacturer's operating and maintenance manual. Systematically initiate specified functional performance items at each station including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications. Observe all voice audio for routing, clarity, and quality, freedom from noise and distortion, and proper volume level.

9. Test both primary power and secondary power. Verify, by test, the secondary power system is capable of operating the system for the period and in the manner specified.

F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log upon the satisfactory completion of tests.

H. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.

3.6 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Vacuum clean dust and debris from inside and outside of all fire alarm control panels, fire alarm junction boxes and all fire alarm equipment not protected from dust and debris during construction.

3.7 DEMONSTRATION

A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.
1. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 16 hours' training. All instruction sessions shall be audio/video taped in a digital format by the system supplier. Provide two (2) record copies on DVD media to the University within two weeks.
2. Schedule training with the Owner at least seven days in advance.

3.8 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed, that are packaged with protective covering for storage, and that are identified with labels clearly describing contents.
1. Glass Rods for Manual Stations: Furnish 12 rods per building.
2. Ceiling Speakers: Furnish 12 complete assemblies per building.
3. Wall Mounted A/V Units: Furnish 4 complete assemblies per building.
4. Smoke Detectors: Furnish 4 detectors per building.
5. Detector Bases: Furnish 4 bases per building.

END OF SECTION